

Roosevelt Wild Life Bulletin

OF THE

Roosevelt Wild Life Forest Experiment Station

OF

THE NEW YORK STATE COLLEGE OF FORESTRY
AT SYRACUSE UNIVERSITY

BIRDS OF CENTRAL NEW YORK MARSHES

NOTES ON THE BIRDS OF ALLEGANY PARK

CONTENTS OF ROOSEVELT WILD LIFE BULLETIN

(To obtain these publications see announcement on back of title page.)

ROOSEVELT WILD LIFE BULLETIN, Vol. I, No. 1. December, 1921.

1. Foreword.....Dr. George Bird Grinnell.
2. Roosevelt Wild Life State Memorial.....Dr. Charles C. Adams.
3. Appropriateness and Appreciation of the Roosevelt Wild Life Memorial.....Dr. Charles C. Adams.
4. Suggestions for Research on North American Big Game and Fur-Bearing Animals.....Dr. Charles C. Adams.
5. Theodore Roosevelt.....Sir Harry H. Johnston.
6. Roosevelt's Part in Forestry.....Dr. Gifford Pinchot.
7. Roosevelt and Wild Life.....Mr. Edmund Heller.
8. The Present Economic and Social Conditions as Results of Applied Science and Invention.....Hon. George W. Perkins.
9. Suggestions for Management of Forest Wild Life in the Allegany State Park, New York.....Dr. Charles C. Adams.
10. Aims and Status of Plant and Animal Preserve Work in Europe, with Special Reference to Germany, Including a List of the Most Important Publications on These Preserves.....Dr. Theodor G. Ahrens.
11. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. I, No. 2. August, 1922.

(Out of Print)

1. An Opportunity for Great Public Service.....Col. Henry S. Graves.
2. An Investigation of the Beaver in Herkimer and Hamilton Counties of the Adirondacks.....Dr. Charles E. Johnson.
3. The Life of the Yellowstone Beaver.....Mr. Edward R. Warren.
4. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. I, No. 3. March, 1923.

1. The Summer Birds of the Allegany State Park..Aretas A. Saunders.
2. The Ruffed Grouse, with Special Reference to its Drumming.....Edmund J. Sawyer.
3. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. I, No. 4. March, 1923.

1. Relation of Summer Birds to the Western Adirondack Forest.....Perley M. Silloway.
2. Notes on the Relation of Birds to Adirondack Forest Vegetation....Dr. Charles C. Adams.
3. The Summer Birds of the Adirondacks in Franklin County, N. Y.....Theodore Roosevelt, Jr., and H. D. Minot.
(Reprinted: original date of publication, 1877.)
4. Current Station Notes.....The Director and Editor.

Roosevelt Wild Life Bulletin

VOLUME 3, NUMBER 3

OF THE

Roosevelt Wild Life Forest Experiment Station

OF

THE NEW YORK STATE COLLEGE OF FORESTRY
AT SYRACUSE UNIVERSITY



ANNOUNCEMENT

The serial publications of the Roosevelt Wild Life Forest Experiment Station consist of the following:

1. Roosevelt Wild Life Bulletin.
2. Roosevelt Wild Life Annals.

The *Bulletin* is intended to include papers of general and popular interest on the various phases of forest wild life, and the *Annals* those of a more technical nature or having a less widespread interest.

These publications are edited in cooperation with the College Committee on Publications.

The editions of these publications are limited and do not permit of general free distribution. Exchanges are invited. The subscription price of the *Bulletin* is \$4.00 per volume of four numbers, or \$1.00 per single number. The price of the *Annals* is \$5.00 per volume of four numbers, or \$1.25 per single number. All communications concerning publications should be addressed to

THE DIRECTOR,
Roosevelt Wild Life Forest Experiment Station,
Syracuse, New York.

COPYRIGHT 1926 BY

ROOSEVELT WILD LIFE FOREST EXPERIMENT STATION

Entered at the Post Office at Syracuse, N. Y., as second-class matter.

TRUSTEES OF THE NEW YORK STATE COLLEGE OF FORESTRY

EX OFFICIO

Dr. CHARLES W. FLINT, <i>Chancellor</i>	Syracuse University
Dr. FRANK P. GRAVES, <i>Commissioner of Education</i> ..	Albany, N. Y.
Hon. ALEXANDER MACDONALD, <i>Conservation Comm'er</i> ..	Albany, N. Y.
Hon. SEYMOUR LOWMAN, <i>Lieutenant-Governor</i>	Albany, N. Y.

APPOINTED BY THE GOVERNOR

Hon. ALEXANDER T. BROWN.....	Syracuse, N. Y.
Hon. JOHN R. CLANCY.....	Syracuse, N. Y.
Hon. HAROLD D. CORNWALL.....	Glenfield, N. Y.
Hon. GEORGE W. DRISCOLL.....	Syracuse, N. Y.
Hon. LOUIS MARSHALL.....	New York City
Hon. WILLIAM H. KELLEY.....	Syracuse, N. Y.
Hon. EDWARD H. O'HARA.....	Syracuse, N. Y.
Hon. CHARLES A. UPSON.....	Lockport, N. Y.
Hon. J. HENRY WALTERS.....	New York City

OFFICERS OF THE BOARD

Hon. LOUIS MARSHALL.....	<i>President</i>
Hon. JOHN R. CLANCY.....	<i>Vice-President</i>

HONORARY ADVISORY COUNCIL OF THE ROOSEVELT WILD LIFE STATION

AMERICAN MEMBERS

Mrs. CORINNE ROOSEVELT ROBINSON.....	New York City
Hon. THEODORE ROOSEVELT.....	New York City
Mr. KERMIT ROOSEVELT.....	New York City
Dr. GEORGE BIRD GRINNELL.....	New York City
Hon. GIFFORD PINCHOT.....	Harrisburg, Pa.
Mr. CHAUNCEY J. HAMLIN.....	Buffalo, N. Y.
Dr. GEORGE SHIRAS, 3rd.....	Washington, D. C.
Dr. FRANK M. CHAPMAN.....	New York City
Dean HENRY S. GRAVES.....	New Haven, Conn.

EUROPEAN MEMBERS

VISCOUNT GREY	Fallodon, England
Sir HARRY H. JOHNSTON.....	Arundel, England

ROOSEVELT WILD LIFE STATION STAFF

FRANKLIN MOON, M.F.....Dean of the College

CHARLES C. ADAMS, Ph.D., Sc.D.....Director of the Station*
ALVIN G. WHITNEY, A.B.....Assistant Director
WILLIAM CONVERSE KENDALL, A.M., M.D.....Ichthyologist
WILFORD A. DENCE, B.S.....Assistant Ichthyologist

Temporary Appointments†

THOMAS L. HANKINSON, B.S.....Ichthyologist
PERLEY M. SILLOWAY, M.S.....Roosevelt Field Ornithologist
CHARLES E. JOHNSON, Ph.D.....Roosevelt Field Naturalist
ARETAS A. SAUNDERS, Ph.B.....Roosevelt Field Ornithologist
BRADFORD A. SCUDDER.....Roosevelt Game Naturalist
ALFRED O. GROSS, Ph.D.....Roosevelt Field Ornithologist
ROBERT T. HATT, A.M.....Roosevelt Field Naturalist

Collaborators†

EDWARD R. WARREN, B.S.....Roosevelt Game Naturalist
RICHARD A. MUTTKOWSKI, Ph.D.....Roosevelt Field Naturalist
MILTON P. SKINNER, B.S.....Roosevelt Field Naturalist

* Resigned May 1, 1926.

† Including only those who have made field investigations and whose reports are now in preparation.

THE RELATION OF FORESTS AND FORESTRY TO HUMAN WELFARE

"Forests are more than trees. They are rather land areas on which are associated various forms of plant and animal life. The forester must deal with all. Wild life is as essentially and legitimately a part of his care as are water, wood and forage. Forest administration should be planned with a view to realizing all possible benefits from the land areas handled. It should take account of their indirect value for recreation and health as well as their value for the production of salable material; and of their value for the production of meat, hides and furs of all kinds as well as for the production of wood and the protection of water supplies.

"Unquestionably the working out of a program of wild life protection which will give due weight to all the interests affected is a delicate task. It is impossible to harmonize the difference between the economic, the aesthetic, the sporting and the commercial viewpoint. Nevertheless, the practical difficulties are not so great as they appear on the surface."

HENRY S. GRAVES,

Former Chief Forester, U. S. Forest Service.

Recreation, Vol. 52, p. 236, 1915.

CONTENTS

	PAGE
1. The Summer Birds of Central New York Marshes.	
Aretas A. Saunders	335
2. Additional Notes on the Summer Birds of Allegany State Park.	
Aretas A. Saunders	477
3. Current Station Notes.....	Charles C. Adams 499

ILLUSTRATIONS

PLATES

Plates 6 and 7 are reproduced from watercolor drawings by Edmund J. Sawyer; plates 8 to 19 are from field sketches by the author.

PLATE 6. BIRDS OF MARSH AND SWAMP, NEAR MONTEZUMA MARSH, NEW YORK

- 1: Black Duck; 2: American Bittern; 3: Black-crowned Night Heron (young); 4: Black-crowned Night Heron (adult); 5: Green Heron; 6: Great Blue Heron; 7: Wood Duck (male, eclipse plumage); 8: Wood Duck (female). *Drawn by Edmund J. Sawyer.....Facing* 335

PLATE 7. BIRDS OF THE CAT-TAIL MARSHES; MONTEZUMA MARSH, NEW YORK

- 1: Blue-winged Teal (male, eclipse plumage); 2, 3: Florida Gallinule (adult and immature); 4: Least Bittern; 5: Black Tern (adult); 6: Sora, or Carolina Rail; 7, 8: Virginia Rail (adult and immature); 9: Black Tern (immature); 10: Florida Gallinule (young). *Drawn by Edmund J. Sawyer....Facing* 440

PLATE 8. BLACK TERN

- 1: in flight; 2: hovering; 3: young bird, sitting on ground; 4: adult, perching; 5: flight, front view (at bottom of wing beat); 6: flight, front view (at top of wing beat); 7: young Tern watching parent approach with food; 8: adult dropping food; 9: young receiving food.....*Attend.*

PLATE 9. BLACK DUCK

- 1: swimming; 2: feeding by scooping surface in shallow water; 3: Swan pose; 4: alert and watchful; 5: feeding pose; 6: wading in shallow water; 7: feeding by immersing bill; 8: feeding by tipping up; 9: preening back; 10: scratching ear; 11: preening side feathers; 12: preening breast; 13, 14: end of a quarrel; 15: asleep—with an eye open.....*Attend.*

PLATE 10. WOOD DUCK

- 1, 2: poses while feeding on surface; 3: a mother with downy young; 4: feeding; 5: front view, perching on a stump; 6: swimming fast in weedy water; 7: Swan pose; 8: asleep, front view; 9: resting, side view; 10: in flight; 11: dropping to alight in water; 12: a drake, resting.....*Attend.*

PLATE 11. AMERICAN BITTERN

- 1: characteristic pose; 2: adult and young; 3: beginning fishing; 4: fishing pose; 5: fishing in shallow water; 6: running through cat-tails; 7: perching in cat-tails; 8: attracted by a noise....
Attend.

PLATE 12. LEAST BITTERN

PAGE

1: approaching a fishing place; 2: beginning fishing; 3: getting more interested; 4: straight-line pose, just before catching a fish; 5: leaving the fishing ground, back view; 6: walking down a cat-tail stalk, toeing in; 7: another fishing pose; 8: stalking over the cat-tails; 9: attracted by some noise....

Atend.

PLATE 13. GREAT BLUE HERON

1: perching; 2, 3: fishing poses; 4: about to alight; 5: resenting approach of bird in 4 above; 6: young heron with a bullhead; 7: normal flight; 8: flight with outstretched neck....

Atend.

PLATE 14. GREEN HERON AND NIGHT HERON

Green Heron—1: perching; 2: climbing; 3: disturbed by a muskrat; 4: another perching pose; 5, 6: fishing poses. Night Heron—7, 8: perching; 9: flight; 10: wading; 11, 12: fishing poses.....

Atend.

PLATE 15. VIRGINIA AND SORA RAILS

Virginia Rail—1: searching for food; 2: front view; 3: running; 4, 5: probing; 6: walking; 7: feeding in foliage overhead; 8: preening breast; 9: sitting down to rest. Sora—10: searching for food; 11: front view,—“thin as a rail”; 12: a feeding pose; 13: swimming; 14: walking, front view; 15: frightened, running to shelter.....

Atend.

PLATE 16. FLORIDA GALLINULE

1: watching the water; 2: running; 3: fishing like a Bittern; 4: another running attitude; 5: removing water weeds from foot; 6: standing at edge of cat-tails; 7: wading, rear view; 8: wading and feeding; 9: swimming; 10: swimming in thick weeds; 11: swimming with feet appearing above water; 12, 13: feeding on duckweed; 14: parent about to feed downy young; 15: another feeding pose.....

Atend.

PLATE 17. YELLOW-LEGS

1, 2: feeding; 3: bathing; 4, 5: two Yellow-legs in fighting attitude; 6: preening breast; 7, 8: another fighting pose; 9: preening back; 10, 11: end of a fight,—the crouching bird admits defeat; 12: scratching chin.....

Atend.

PLATE 18. SHORE BIRDS

Wilson's Snipe—1: walking; 2: probing; 3: displaying. Pectoral Sandpiper — 4: a normal pose. Least Sandpiper — 5, 6, 7: characteristic attitudes. Spotted Sandpiper—8, 9: two birds in fighting attitudes. Killdeer—10, 11: feeding; 12: displaying; 13: bathing.....

Atend.

PLATE 19. GREBE, KINGFISHER AND TEAL

Pied-billed Grebe—1: swimming; 2: alert; 3: preening; 4, 5: surface feeding; 6: rear view. Belted Kingfisher—7: watching the water; 8: holding a fish crosswise; 9: with a sunfish too large to swallow. Blue-winged Teal—10: swimming; 11: preening; 12: feeding.....

Atend.

FIGURES

All figures are reproduced from photographs by the author except figure 134, which is from a photograph by Dr. Charles E. Johnson.

- FIG. 88. (Field No. 3669). The former main Montezuma Marsh, as it is today. Photo July 31, 1923..... 341
 FIG. 89. (3609). Otter Lake, near Meridian, New York. July 7, 1923.. 341
 FIG. 90. (3604). Muskrat Creek, below Parker Pond. Note the duckweed on the water surface. July 6, 1923..... 342

	PAGE
FIG. 91. (3612). Muskrat Creek, farther downstream. One of the few places where the Pied-billed Grebe was found. July 7, 1923..	342
FIG. 92. (3605). Another view along Muskrat Creek. Wooded swamp with marshy border. July 6, 1923.....	349
FIG. 93. (3663). View on Black Creek, in the heart of the Sink Hole Marsh. July 23, 1923.....	349
FIG. 94. (3603). Cat-tails, the chief vegetation of the marsh. July 5, 1923.	350
FIG. 95. (3620). Where marsh and swamp meet. Arrow arum in the foreground. A breeding haunt of Wood Ducks. July 9, 1923.	350
FIG. 96. (3659). Wooded swamp, lower Montezuma Marsh. The trees are silver maples. July 19, 1923.....	357
FIG. 97. (3615). Swampy thicket, near Muskrat Creek. A breeding ground of the Swamp Sparrow and Alder Flycatcher. July 9, 1923.....	357
FIG. 98. (3631). The shoreline of Crusoe Lake. Cat-tail marsh at the water's edge. July 13, 1923.....	358
FIG. 99. (3630). An "island" of cat-tail in Crusoe Lake. July 13, 1923..	358
FIG. 100. (3628). Black Creek, in the Sink Hole Marsh. July 13, 1923..	365
FIG. 101. (3701). Another view along Black Creek in the Sink Hole Marsh. Aug. 16, 1923.....	365
FIG. 102. (3633). Southern end of the Sink Hole Marsh. An unbroken expanse of cat-tail. The main Montezuma Marsh probably once looked like this. Photo July 16, 1923.....	366
FIG. 103. (3632). A pool in the cat-tail marsh; a special attraction to marsh bird life. July 16, 1923.....	366
FIG. 104. (3735). A pool in late summer dried to a mud-hole. The old logs indicate that the area was once wooded swamp. Aug. 28, 1923.....	373
FIG. 105. (3734). Another pool in the marsh. The edges of such pools are excellent locations for study of bird life from a blind. Aug. 28, 1923.....	373
FIG. 106. (3712). The Clyde marsh on a windy day. This area was created into marsh by flooding due to the Barge Canal. Aug. 19, 1923.....	374
FIG. 107. (3699). Marsh at the head of Byron Mill Pond. A daytime hiding place of Black Ducks. Aug. 13, 1923.....	374
FIG. 108. (3694). View across the Byron Mill Pond. The apple orchard and road show its proximity to civilization. Aug. 10, 1923..	381
FIG. 109. (3691). Extreme upper end of Byron Mill Pond. A Spotted Sandpiper and a Killdeer in front of the border of rushes (center of view). Here Black Ducks were observed feeding and bathing in early morning. Aug. 10, 1923.....	381
FIG. 110. (3654). Narrow-leaved cat-tail, the chief vegetation of the marshes. July 18, 1923.....	382
FIG. 111. (3661). Narrow-leaved and broad-leaved cat-tails growing together. July 20, 1923.....	382
FIG. 112. (3676). Arrow arum. Note the stems of ripening fruits curving downward toward the water. These fruits are an important duck food later in the season. Aug. 3, 1923.....	389
FIG. 113. (3675). Swamp loosestrife. An important plant in the marsh vegetation, forming shelter for many birds. Aug. 3, 1923....	389
FIG. 114. (3686). The common rush. A characteristic plant of the marshes. Aug. 7, 1923.....	390
FIG. 115. (3666). Swamp loosestrife along the stream border. The overhanging branches of loosestrife form a favorite shelter for Ducks, Gallinules and Rails. Note the duckweed on the water surface. Black Creek, July 26, 1923.....	390

FIG. 116. (3653). Reed canary grass; a tall grass that forms small areas of marsh vegetation. July 18, 1923.....	397
FIG. 117. (3684). The water surface from a point vertically above, showing covering of duckweed and bladderwort. Wood Ducks and Gallinules feed from the surface of such marsh waters. Aug. 5, 1923.....	397
FIG. 118. (3685). Purple nightshade, with ripening berries; an important bird food, eaten by Wood Ducks, Gallinules and others. Aug. 5, 1923.....	398
FIG. 119. (3668). Swamp dock. The seeds of this plant are food for Ducks. July 30, 1923.....	398
FIG. 120. (3638). The area where Black Terns breed. Note the scarcity of cat-tails. July 17, 1923.....	405
FIG. 121. (3644). An empty nest, probably of the Black Tern, beneath an arrow arum. July 17, 1923.....	405
FIG. 122. (3646, 3647, 3648). Downy young of the Black Tern in various poses on their bed of cat-tails. July 17, 1923.....	406
FIG. 123. (3702). A Black Duck amid the cat-tails on Crusoe Lake. Aug. 17, 1923.....	413
FIG. 124. (3739). Black Ducks on Crusoe Lake. Cat-tail marsh in background. Aug. 24, 1923.....	413
FIG. 125. (3738). Wood Ducks and an immature Night Heron, on Butler Creek above Crusoe Lake. The Heron stands at the water's edge just back of the rear Duck. Aug. 25, 1923.....	414
FIG. 126. (3681). A Wood Duck in the Sink Hole Marsh. Aug. 3, 1923..	414
FIG. 127. (3614). Young Least Bitterns in the nest. July 9, 1923.....	421
FIG. 128. (3606). Nest and eggs of a Least Bittern in cat-tails. July 6, 1923..	422
FIG. 129. (3607). Nest and eggs of a Least Bittern in swamp loosestrife. July 6, 1923.....	422
FIG. 130. (3744, 3746, 3747, 3745). A Least Bittern in its haunts in the cat-tail marsh. (a) Emerging from the cat-tails; (b) looking about; (c) beginning to fish; (d) intent on fishing. Aug. 28, 1923..	427
FIG. 131. (3709). A Green Heron at a mud-hole in the Sink Hole Marsh. Aug. 18, 1923.....	433
FIG. 132. (3710). Another pose of the Green Heron shown in figure 131. Aug. 18, 1923.....	433
FIG. 133. (3711). A third pose of the Green Heron shown in figures 131 and 132. Aug. 18, 1923.....	434
FIG. 134. A nest and eggs of the Green Heron near Otter Lake. Photo by C. E. Johnson. July, 1923.....	434
FIG. 135. (3677). A Great Blue Heron in the Sink Hole Marsh. Aug. 3, 1923.....	447
FIG. 136. (3700). A Sora Rail at the Byron Mill Pond. Aug. 13, 1923....	447
FIG. 137. (3716). An immature Virginia Rail probing for food in the Sink Hole Marsh. Aug. 20, 1923.....	448
FIG. 138. (3724). An immature Virginia Rail feeding at a mud-hole in the marsh. Aug. 22, 1923.....	453
FIG. 139. (3725). Another view of the Virginia Rail shown in figure 138..	453
FIG. 140. (3727). An immature Florida Gallinule on a log that reaches back into its safe haven of swamp loosestrife. Aug. 23, 1923..	454
FIG. 141. (3671). Bank Swallows lining the telegraph wires, near Montezuma Marsh. July 31, 1923.....	463
FIG. 142. (3690a). A Yellow-legs at the Byron Mill Pond. Aug. 10, 1923..	463
FIG. 143. (3611). A Phoebe on a limb overhanging Muskrat Creek. July 7, 1923.....	463
FIG. 144. (3687). Tracks of the Spotted Sandpiper, and a single footprint of a raccoon in the mud along a stream border. Aug. 8, 1923..	464

PAGE

FIG. 145. (3682). Nest of the Long-billed Marsh Wren. These nests are very abundant in the cat-tail marshes. Aug. 3, 1923.....	464
FIG. 146. (3145, 3148). View down Quaker Run Valley from second clearing at the Lookout; Allegany State Park. Aug. 29, 1922..	476
FIG. 147. (3142). View northeast from first clearing at the Lookout, south of Quaker Run and headquarters. Aug. 28, 1922.....	481
FIG. 148. (3135). A thicket of blackberry and raspberry bushes on the border of the forest; a late summer habitat of the Ruffed Grouse. Aug. 26, 1922.....	481
FIG. 149. (3139). Red raspberries, a late summer food of the Ruffed Grouse. Aug. 17, 1922.....	487
FIG. 150. (3137). Blackberries, a favorite late summer food of the Ruffed Grouse. Aug. 17, 1922.....	487
FIG. 151. (3132). An old moss-covered log and ferns; a feature of the Allegany Park forest. Photo taken on the trail from Buffalo Camp to the caves. Aug. 26, 1922.....	493
FIG. 152. (3147). Typical young maple and beech forest, Allegany State Park. View along trail between Buffalo Camp and the caves. Aug. 26, 1922.....	493

MAP

MAP 6. The Sink Hole section of Montezuma Marsh, and adjacent marsh and swamp lands, showing area recommended for a wild life preserve. (Based on Clyde and Weedsport quadrangles of U. S. Geological Survey topographic atlas, with corrections in location of certain swamp and marsh areas.).....	<i>At end.</i>
--	----------------

RESEARCH ON WILD LIFE

"The discovery of new species and races based upon the study of preserved specimens of game animals, has already progressed very far; but the more attractive field which includes the habits of the game remains yet to a great extent unexplored. This field is peculiarly open for investigation to big-game hunters, and to all other men who go far afield and obtain first-hand knowledge of the conditions under which the game animals live. The closet naturalist, with his technical knowledge of the structure of animals, can be trusted to perform the work of classification to a mathematical degree of precision; but we cannot obtain from him a trustworthy account of the behavior of animals in their natural environment, or learn from him the value to the animals of the various structures or characteristics which he has shown them to possess. Much knowledge regarding the habits of game is acquired by the successful sportsman. Yet it is often infinitesimal in quantity compared to what may be acquired if the outdoors observer will direct his investigations along the broad lines covering the life history of the species with which he comes in contact. To carry out such investigations successfully it would be necessary to spend many hours and days, perhaps even weeks and months, observing certain individuals or family groups of game. This is quite beyond the limits of time allotted the average sportsman. Nevertheless much can be learned by the collected evidence from many fragmentary observations providing only these are accurate. A great mass of accurate fragmentary observations will often spell far more progress in investigations of this kind than the observations of a few trained individuals over an extended period of time."

THEODORE ROOSEVELT and EDMUND HELLER.

Life Histories of African Game Animals,

Vol. I, pp. vii-viii, 1914.



Drawn by Edmund J. Sawyer

PLATE 6. BIRDS OF MARSH AND SWAMP, NEAR MONTEZUMA MARSH, NEW YORK

- | | |
|---------------------------------------|---------------------------------------|
| 1: Black Duck. | 5: Green Heron. |
| 2: American Bittern. | 6: Great Blue Heron. |
| 3: Black-crowned Night Heron (young). | 7: Wood Duck (male, eclipse plumage). |
| 4: Black-crowned Night Heron (adult). | 8: Wood Duck (female). |

(All figures $\frac{1}{2}$ life size)

D. A. Mac L. Lib.

THE SUMMER BIRDS OF CENTRAL NEW YORK MARSHES

BY ARETAS A. SAUNDERS

*Roosevelt Field Ornithologist, Roosevelt Wild Life Forest
Experiment Station, Syracuse, N. Y.*

CONTENTS

	PAGE
1. The Values of Marsh Lands and Their Wild Life.....	335
Educational and Recreational Value of Marshes.....	335
Economic Value of Marsh Lands.....	344
Our Defective Knowledge of Marsh Birds.....	348
Conservation of New York Marshes.....	352
2. Description of the Marshes Studied.....	354
3. Life of the Marshes Other than Birds.....	367
4. Method of Studying the Marsh Birds.....	369
5. Notes on the Birds Observed.....	372
6. Summary and Conclusions.....	467
7. List of References.....	468

THE VALUES OF MARSH LANDS AND THEIR WILD LIFE

Educational and Recreational Value of Marshes. We are recognizing more and more the value of wild life in this country, not only from the economic standpoint, but also from that of education, recreation and sport. We are turning from the crowded turmoil of city life to the wild places of nature for greater health and happiness. We find in these places rest for the mind, vigorous activity for the body and a broadening educational influence, beneficial both to business men and women, and to growing young people. We cannot measure the full value of the wild to mankind in dollars and cents, or estimate how much our mental and physical health may be benefited, how much broader and saner our outlook on life may become by turning to nature and wild places for recreation. But we do know that to each individual, to each community, and to the nation as a whole, wild nature and the numerous forms of wild life that comprise it have a tremendous recreational value.

We cannot always find this in small city parks, open groves of trees, or beds of well-kept flowers, for these places show all too plainly the touch of the hand of man. Such places have their value to the city dweller when he cannot get farther away. But they are too largely devoid of any real wild life. They cannot furnish the touch of the primitive that we need.

Yet as civilization advances, wild areas disappear. As population increases, wild animals and plants decrease. We cut off our forests, plow up our fields and drain our marshes. Many of us give no thought whatever to the wild life that found a home in these places and cannot live when the conditions are changed. We look at wild land as so much "wasted" that might be converted into something yielding dollars and cents to its owners. We forget that such areas may often yield an economic return in their natural condition. We overlook the great value of these things that we cannot measure in money.

It is almost pathetic to view the delight of a child in a city park over the sight of his first gray squirrel; pathetic because it illustrates how small is the opportunity for many city children to know much of such wholesome delights. It is more than pathetic when we contemplate older young people brought up in the midst of the city, wise in its ways, but vastly ignorant of the world outside, seeking new thrills in cheap literature and low-grade moving pictures, but no longer interested in the great out-of-doors and the more wholesome interest that might be had there for the seeking. We can be thankful that all young people to-day have not so lost their opportunities and become so handicapped. We can hope that in the days to come wild places will be saved numerous enough and accessible enough that future generations may have opportunity to get the broader mental vision, the saner outlook upon life to be attained in the knowledge and contemplation of wild nature.

Another reason why we should save areas of all types in the wild state is that the life of these areas may remain under natural conditions for educational and scientific study. Our knowledge of wild life under such conditions is decidedly meager, and if natural conditions are destroyed we may never get the opportunity to acquire this knowledge. Practical people may object that such knowledge has no economic justification and that it is therefore unnecessary for us to acquire it. This, however, is the common popular misunderstanding of the scientist and his attitude. To most people, so long as the scientist discovers practical things that can make our lives

easier, better or safer, or that can be applied in manufacture or commerce, he is welcomed and praised, but when he busies himself discovering facts that have no immediate, apparent practical value he is merely queer, to be endured perhaps, but not encouraged.

But the history of scientific development has shown that in all lines obscure and apparently unimportant facts have suddenly proven to be very useful. The scientist who does discover something practical has built upon the apparently impractical work of those that preceded him. We should never have had our initial knowledge of electricity had the scientist waited to catch a clear vision of its future economic value before proceeding to experiment. In the early days the study of electricity was merely a hobby of such a scientific "crank," and even he never dreamed of the great commercial uses to be made of his discoveries later.

This is one example, but there are many more in the history of science. We never know when some knowledge we acquire is going to prove useful. Any fact, however obscure, that increases the knowledge of mankind is worth knowing. The aim of the scientist, the acquirement of knowledge for the mere sake of the knowledge itself, is justified. The practical man is justified if he encourages that scientist. The study of wild life under natural conditions, even in its apparently least important forms, is worth while, and the saving of all kinds of natural areas in their primitive conditions for all time to come, where such studies can be carried out, is necessary for the future welfare of mankind.

It might seem possible, and perhaps to some minds, desirable, to civilize our country from one end to the other, to turn all our forests into open groves devoid of undergrowth or fallen logs, to cut down every wayside thicket and tangle of vines, to landscape every hillside, to crisscross all marshes with drainage ditches and make them dry and passable, to poison all the insects so that we will need no birds to keep them in check, and therefore have no birds because their food is destroyed. To attempt such a "complete civilization" would be fraught with great economic danger, and even if the land yielded its utmost to its owners it would prove highly undesirable. To see about us only "civilization" at its highest pitch would take away our opportunity to enjoy wild nature and replace it merely by worship of the objects of man's creation.

If we do not desire such a condition as this we must set aside some areas that they may remain in their natural condition. This has already been done in such areas as the national parks. These

areas, though large, are too few and far away from centers of population to have the complete desired effect. Nor do they cover all the kinds of areas desirable. Many beautiful and interesting species of birds and animals have never lived in such areas as are set aside for ordinary parks, and can never be expected to do so. Such birds as the Sage Grouse and the Long-billed Curlew, for example, can only be saved by setting aside areas of open prairie that are commonly deemed agricultural areas, and therefore opened to settlement. Unlike some other prairie birds, such as Meadowlarks and Killdeers, these birds do not take kindly to advancing civilization, but are gradually disappearing. It would be a pity to allow this to go on to their total extinction. We should set aside, therefore, not only areas of forest and mountains, but areas of grassland and marsh, and samples of all other areas that may contain wild life not to be found elsewhere.

To the general public marshes and swamps have acquired a bad reputation by no means deserved. The average person thinks of them as filled with mosquitoes, disease germs, noxious gases and poisonous snakes. In marsh areas of northern United States poisonous snakes are largely unknown. While there are places where marsh gas is liberated, when one stirs up the mud by wading through it, it is my experience that this is not particularly common, and that when one stands still—the best method for natural history observations—the gas is not noticeable. I have never heard of its occurrence in sufficient quantity to do any physical harm. The notion that diseases, such as malaria, were caused by gases and vapors from marshes has been discarded, though it seems to cling still in the minds of superstitious and ignorant people. While it cannot be denied that mosquitoes breed in marshes and are often abundant there, still this is not always the case, and it is often true that mosquitoes are just as abundant in ordinary woodlands, places that large numbers of campers and nature lovers visit in the summer months. In 1923 mosquitoes were more abundant in swampy woodlands than marshes, and gave comparatively little annoyance. Toward the end of the season they were decidedly rare. My most unpleasant experiences with mosquitoes have not been in marsh areas, and I am inclined to think that the special prevalence and abundance of mosquitoes in marshes has been exaggerated.

The question of malaria and mosquitoes may apply to some marshes, but investigation has shown that malaria is not a common disease in the vicinity of the Montezuma Marsh (Eaton, '14, p. 35).

Evidently either the germ itself, or the particular mosquito that carries it is absent from the region.

Marshes, then, are not so bad as they are popularly supposed to be. In fact the discomforts experienced in them are no greater than those of ordinary forests and woodlands. He who is unwilling to put up with some slight discomforts is no outdoor man, and had best remain in the city. Travelling on foot in a marsh is slow, to be sure, and one should be equipped for it, or expect to get wet and muddy, but if one is careful where he steps there is no particular danger. There is certainly no greater danger than that of slipping from logs when travelling through a windfall in the forest, or coming to grief on a steep hillside strewn with loose rocks. People are usually most afraid of that with which they are least familiar. Marshes are unfamiliar to most people and so are imagined full of dangers. While there is always a small element of danger anywhere in wild land none of it can compare with the dangers of city streets, where people who would run from a harmless snake or a bee, plow through the traffic with a smile, for they do it every day and haven't yet been hit.

When it comes to the question of wild life many things favor the marsh over ordinary woodland. Both plant and animal life are abundant. The forms are unusual, different from the better known ones, and often more or less rare. Very little is known about them, so that they possess a peculiar deep interest. The naturalist, teacher or pupil, when it is only a matter of what variety he will find, what creatures he will be able to watch, and what he will learn that is new, will frequently prefer the marsh to the forest.

Aside from their importance and interest marsh areas are a beautiful part of the natural landscape. The great sea of green cat-tails waving in the breeze, the luster of the leaves of sweet flag and bur-reed, the white purity of the arrowhead blossoms, and the blue of the pickerel-weed and the iris, the graceful drooping stalks of swamp loosestrife, and the feathery tops of the marsh grasses are parts of nature's pictures we would not care to miss. If we add to the scene a flock of Black Ducks in flight, a Great Blue Heron flapping majestically with its curled neck and long outstretched legs, or a Bittern fishing in the edge of the water, we have a picture of wild natural beauty that has few parallels elsewhere. It is time for the nature lover to give a broader attention, and a finer appreciation to the marsh and its wild life and to consider seriously its fate in the near future. Certainly some of these representative tracts

should be preserved in the natural wild state and others might be preserved as hunting grounds.

In arguing for game protection, in passing legislation to save wild life, we have too often assumed that the problem was merely one of refraining from direct destruction of the life itself. We have made closed seasons, passed laws limiting the size of the hunter's bag, defined the weapons and methods by which he may take game, and assumed that we have done our duty and that now the game ought to increase. Yet all the time the spread of civilization goes on, destroying the areas where the wild creatures we would protect have always lived, giving them no room to exist and find their food and reproduce. We destroy predatory animals and birds because they destroy wild life, and at the same time we destroy the cover under which wild creatures find protection from their enemies, and suitable breeding conditions.

As has been pointed out (Grinnell and Storer, '24, p. 37), three things are necessary to the lives of wild creatures,—a suitable place to breed, a place in which to take refuge from natural enemies, and a supply of food. Civilization destroys one or more of these for many species. All the game laws, all the closed seasons and limited bags will be valueless if we take from wild creatures the only places where they can live and find shelter and bring up their young.

For the destruction of wild life in the past we have been inclined to blame the hunters and sportsmen. While it is not to be doubted that they have killed large quantities of game, particularly when there were no restrictions placed upon hunting, yet this game could not have continued to maintain itself as civilization advanced. Where areas remain in natural conditions wild creatures continue to live in spite of the hunter. But when civilization destroys their haunts, the wild creatures disappear whether they are hunted or not. It is illegal to kill more than a small number of certain kinds of game in a year, but it is not illegal to drive all the game and other wild creatures, numbering thousands, from the only homes they have known for centuries, to areas where they cannot survive, even when it will result in extermination,—all in the name of agriculture.

In attempting to save certain wild species from destruction because they are classed as game we have often supposed it was incumbent on us to assist nature by destroying the predatory animals that are their natural enemies. We forget when we do this that these creatures are wild animals too, animals whose struggle for



Fig. 88. The former main Montezuma Marsh, as it is today. Photo July 31, 1923.



Fig. 89. Otter Lake, near Meridian, New York. July 7, 1923.



Fig. 90. Muskrat Creek, below Parker Pond. Note the duckweed on the water surface. July 6, 1923.



Fig. 91. Muskrat Creek, farther downstream. One of the few places where the Pied-billed Grebe was found. July 7, 1923.

existence is fully as keen as that of the creatures we desire to save. We forget that under *natural* conditions wild creatures have been able to compete with their enemies for ages and do not need our assistance. We are only beginning to learn that when wild creatures are thus protected and their natural enemies destroyed, they often increase so rapidly that there is not room or food enough for them all; and particularly in winter, the season of short food supply, many more may die of starvation than would have ever been killed by natural enemies. We are also learning that when wild creatures increase, due to lack of natural enemies, disease often wipes them out. The weaker members, that first get the diseases, would have been weeded out had their natural enemies been present in sufficient numbers. Therefore, attempts to save certain species of wild life while destroying others, will not be likely to succeed. Our attempts should be to save not only areas where wild creatures may live, but *all* the forms of wild creatures that live on those areas, in reasonable numbers.

It is perfectly true that there are many species, particularly smaller birds and mammals, that do not need areas in virginal conditions to preserve them. As man has come and spread they have changed their ways of living to suit the new conditions. The Chimney Swift left its hollow trees to live in man's chimneys, and the Barn Swallow forsook its rock caves for barns. The Night-hawk is deserting its high and lonely rock ridges to live on the flat gravel roofs of city skyscrapers. If this were true of all wild creatures we would have no need to worry over their extinction. But many wild creatures are particularly adapted to certain areas. When man destroys these areas they find no substitute. Their home, their shelter and their food are gone and starvation and extinction must be the outcome.

Marsh birds are highly specialized for marsh life. Their food and shelter and breeding places are to be found in marshes only. They can live and thrive nowhere else. As marsh areas are drained and cultivated they disappear. For a time they may concentrate their numbers on some similar area not yet drained, and this often results in the failure of the food supply, and death in large numbers by starvation (Nelson, '24, p. 9). Throughout the United States the drainage of swamp and marsh lands has tremendously decreased the numbers of these specialized birds and animals that made such areas their homes for generations. If drainage continues and finally becomes complete, these species must become extinct.

Economic Value of Marsh Lands. Some practical man will ask: Is not drainage necessary to the development of our country? Is it not a good thing to turn marshes and swamps into productive farms, even though it destroys wild life? Are not such farms of more value than marsh lands populated with wild creatures? Undoubtedly many lands have been drained and converted into profitable farms, but this is by no means always the case. Drainage has progressed in the past following the erroneous idea that all drainage is always beneficial. Too often this has not proven to be the case. Frequently drainage has resulted in a large expenditure of money, both public and private, and an area has been made that is mainly waste land, unsuited either to farming or useful as a home for wild life (Nelson, '24, p. 9).

By consulting drainage reports and statistics of the United States Government (McCrary, '19, Elliott, '09, Wright, '07) one sees only the attitude of the drainage engineer, the idea that all marsh areas are better off drained, the consideration chiefly of the engineering problems involved with the cost per acre of drainage, and probable selling price of the land when drained. When the actual fertility of the land after drainage is discussed it is assumed that because it has proven fertile in some cases that it is always fertile. Neither wild life, its recreational, economic or scientific value, nor the actual productivity of the soil in each particular case has been considered. Statistics such as these have attracted men to invest capital in drainage enterprises, and when they have not lived up to expectations the loss of money involved has not generally been with these investors but with the farmers or would-be farmers who have purchased the drained land.

Large portions of certain drained areas have proved worthless after drainage. Sometimes the soil has proved sandy and infertile, as in the Kankakee Marshes of Indiana. At other times drainage has resulted in worthless peat bogs, as at Mud Lake, Minnesota, and the Horicon Marshes in Wisconsin (Avery, '23). Sometimes the soil of drained areas is hard clay where surface water will not drain off sufficiently to make the best agricultural conditions, as at Thief Lake, Minnesota. At Klamath Lake, Oregon, once one of the most wonderful homes of wild life to be found anywhere in the United States, the soil after drainage proved so strongly alkaline that most of it was unfit for agriculture. Klamath Lake had been made a bird reservation. Birds were protected from the gun, but not from drainage. It would have been much wiser in all these

cases to have investigated before drainage, and determined the probable value and productivity of the land, not only in relation to the cost of drainage, but also in relation to the value of the wild life destroyed or driven out. Who knows, for example, how great might have been the actual economic, to say nothing of other values, of Klamath Lake, to the surrounding population, had it been preserved as a real sanctuary of wild life, and made a Mecca for naturalists, sportsmen and others? Who knows how great a difference it made in the abundance of game, not only at Klamath, but in other regions to which the game migrated? The nature student, the sportsman, the scientist and the farmer, all have a right to object to such drainage without intelligent forethought.

The pressure to drain marsh lands has come more often from real estate promoters than from farmers. It has not been brought about so much by economic necessity as by speculative financial opportunity. The average farmer is not particularly urgent that marsh lands be drained. A few who own marsh land, and are unable to appreciate the value of such land as it is, may value drainage since it gives them opportunity either to use the land in a way they understand, or to sell it at a profit. But the farm problem today is more a matter of making better and greater use of the land already under cultivation, of attracting more men to farm work that the lands now in use may be made more fully productive. This was certainly true in central and western New York in 1923, when farmers' grain and hay crops stood in the fields till over-ripe, because there were not men enough to do the necessary work. Such men were not talking of drainage to create more farm lands.

While most of those in favor of unrestricted drainage have ignored the question of wild life completely, it is true that there have been some arguments for drainage that have considered it; for example, E. V. Willard, in an article entitled "Drainage Development in Its Relation to Wild Animals and Plant Life and Rain-fall" ('24). Mr. Willard's argument is that lands have always been based on their agricultural value, and that therefore they must always be so based; that our country has become prosperous through such valuation of land. But cannot our ideas change and evolve? Are all lands to be always valued only on an agricultural basis? Have we not made mistakes in the past due to just this idea? We would be still more prosperous had such mistakes not been made. Nearly half of the area of the State of Connecticut for example is waste land today because it was valued from the agricultural

standpoint, and cleared for farms in the past, and then when the poor soil proved farming unprofitable, abandoned to grow up to thickets of sumach, bayberry, white birch and red cedar,— useless, unprofitable, slow-growing trees and shrubs, beautiful to look at, supporting a wealth of thicket-loving birds, but from the economic standpoint practically worthless. Such lands should have remained in forest. They can only be made forests again by planting and long waiting, after which the lands will be producing what they were naturally made to produce. The old-time lumberman justified his destruction of forests on the argument that the land would later be turned into farms. There are innumerable examples where the land was laid waste and never farmed. The drainage promoter is using the same argument today, disregarding the fact that the land after drainage is not always useful for agricultural purposes.

Mr. Willard speaks of the sportsman as entirely distinct from the nature student, and as not possessing “worthy ideals and motives.” But the man Mr. Willard is thinking about is not a sportsman at all. I believe that among hunters, the “game hog,” the man who measures his sport by the size of his bag, though he may make the most impression, is in a small minority; that the majority of hunters are not particularly greedy, and they are at the same time nature students, observing rigidly the game laws and rights of property owners, and taking back from their days afield, not merely a bag of game, but a rich store of memories of the beauty of nature in the wild, getting pleasure from their trip in the field, even though they get no game at all.

Mr. Willard states definitely that the sportsman is most responsible for the scarcity of game and the decrease of wild life. Of course unrestricted hunting, by fair means or foul, at all seasons of the year, would undoubtedly soon exterminate many forms of wild life. But no true sportsman desires this. Hunting under restrictions that kill a few birds or animals each year can never result in extermination as will complete destruction of the large areas that form the homes of wild species. That this is a fact is easily proven, for when marshes are drained, not only the ducks and rails disappear from the area, but species that have never been considered game, such as the Least Bittern and Long-billed Marsh Wren — the latter at least being too small to have suffered even from the game hog who shoots everything he sees on sight. Yet Long-billed Marsh Wrens disappear when the marshes are drained, and they will be just as extinct as the King Rail if the day comes when we have no marshes.

That marsh and swamp lands may have an economic value as well as a recreational and educational one, on account of their wild life, is a fact not fully realized. This fact is well illustrated in the success of Mr. S. C. Vanderbilt, owner of a large part of the Sink Hole Marsh in New York State. Through the protection of this marsh, and the trapping of muskrats on conservation principles Mr. Vanderbilt has had greater economic success than all the farmers about him (cf. Johnson, '25, p. 303). His marsh, moreover, remains in practically natural conditions and supports a large number of breeding wild ducks, rails, bitterns and gallinules, a wealth of wild life to be found in few other regions today. It produces excellent duck hunting in the fall for those privileged to use it, and to the naturalist it is an area filled with delights. It was the source of a large part of the observations and studies that make up the main text of this paper. There are other regions where conserving marshes for muskrats has proven successful (cf. Minn. Game and Fish Dept., '23). Not only muskrats, but wild fowl, fish and other forms of wild life may prove a source of income to the owner of marsh land.

In the Sink Hole Marsh there is some economic value to the broad-leaved cat-tail. A number of men in the region earn part of their living by cutting "flag," as it is commonly termed, in late summer and fall. The leaves are gathered in late summer and used in the manufacture of chair bottoms. The stalks are gathered a little later, and the soft interior parts used between staves in the manufacture of tight cooperage. The narrow-leaved cat-tail has too narrow leaves and too hard a stem to be desirable for these purposes. While the market for these products is not great it nevertheless forms an additional way in which the marsh land may be made economically productive without drainage.

The supposed detrimental effect of drainage upon rainfall has not been proven. There are, however, other effects that are detrimental, that are much more definite, and that may make the process of drainage a serious mistake, even though it produces land valuable for agriculture. Drainage of swamps and marshes at the heads of important streams may result in the lowering of the water table; the drying up of springs; an increased fire danger in the forest; the seeping away of underground sources of water in certain areas, as springs and wells, making the areas less productive agriculturally than they were before; an increased temperature of the waters, so that trout, and most fish save the undesirable carp, are no longer

able to live there. All of these effects of drainage have been noted in investigations in Minnesota (Surber, '23). In advocating other drainage projects it behooves us to go slowly. Whenever we disturb natural conditions there is likely to be some unexpected detrimental effect, often greater than the benefit derived by such disturbance.

Our Defective Knowledge of Marsh Birds. If we group birds ecologically, there is no one group about which so little is known as the birds that dwell in marshes. With the growing scarcity of good marsh areas and of marsh birds, due to drainage, this is particularly unfortunate. In the earlier days, when our marshes were undisturbed, most ornithologists were chiefly collectors, and they visited marshes mainly with the idea of bringing back a few skins or sets of eggs. It is to be feared that many of our ornithologists today are still mainly collectors, not so much of eggs and skins, but of lists of birds seen and identified. They visit the marsh, for that will add ten or a dozen species to the day's list that they could not find elsewhere. But once the rare marsh bird is routed from its haunt sufficiently to be seen and identified the interest is gone, and they must "hike" on elsewhere where another species is to be found. So marsh bird literature is mainly lists of names, or descriptions of nests and eggs. A few observers have gone to the marsh with cameras, and this has resulted in some longer and more intimate study, but even here the craze for a picture has often detracted from such study, and when energy is turned almost wholly toward getting a picture, frequently that of a disturbed bird not acting naturally, many things that might be learned are neglected. If we must bring back something with us, eggs, skins, pictures or lists of birds seen, why not add to these a few pages of notes on observations? This is generally needed for all kinds of bird life, but it is particularly needed for the marsh birds. It is astonishing how little has been written about such a wonderful area as the Montezuma Marsh once was.

Another curious characteristic of marsh bird literature is that on the whole more has been written about the very rare species than about the common ones. Much less writing has been done about the Least Bittern, in proportion to its abundance, than about Cory's Bittern. Too often it has been assumed that we know all about common birds, and that the only things worth recording are those that relate to something rare. Of course we should learn all that we can about something that is rare, but we need not neglect common species on that account.



Fig. 92. Another view along Muskrat Creek. Wooded swamp with marshy border. July 6, 1923.



Fig. 93. View on Black Creek, in the heart of the Sink Hole Marsh. July 23, 1923.



Fig. 94. Cat-tails, the chief vegetation of the marsh. July 5, 1923.



Fig. 95. Where marsh and swamp meet. Arrow arum in the foreground. A breeding haunt of Wood Ducks. July 9, 1923.

One of the best papers in marsh bird literature is Brewster's "Voices of a New England Marsh" ('03). As the title implies, it is chiefly concerned with the voices of the marsh birds, and does not go into detail as to other habits. This paper has been the main source of our information on this subject, however, and is widely quoted elsewhere. It is interesting to compare what Mr. Brewster has written with my own efforts in this paper to give phonetic renderings of the marsh bird calls. My notes were all made in the field without reference to, or a recent reading of, what Mr. Brewster had written. The differences show how widely two observers may differ when they try to record phonetically what is essentially the same sound.

Another leading paper on marsh birds is Dr. Arthur A. Allen's on the Red-winged Blackbird ('11). While the main part of the paper is devoted to this one species, and an excellent detailed study has resulted, there is in the introductory portion considerable on the general ecology of the cat-tail marsh and its various plants, animals and birds. The descriptions of the zones of plant life along the water's edge, and the animal life inhabiting these zones, indicates that this marsh—the Renwick marsh at the south end of Cayuga Lake—was different in this respect from the marshes I have studied, where the line between cat-tail marsh and open water was usually abrupt.

In his "Ecological Study of the Birds of Ypsilanti Bayou," in Michigan, Mr. Max Minor Peet ('08) has given an excellent detailed account of certain marsh birds, and the conditions under which they live at different seasons. The area treated is small and the paper treats of other species than marsh birds, but it is a good example of the kind of studies we need. Mr. C. G. Abbott, in his "Summer Bird Life of the Newark, New Jersey, Marshes" ('07) has written a valuable account of a number of marsh species, that shows something of the bird life that can exist in a marsh even though it is close to civilization.

A few other shorter papers on marsh bird life have appeared (e. g., Silloway, '97), and a number of studies of single species or certain habits of single species. There are of course many references to marsh birds in local lists and state lists, but reviewing the literature as a whole, no comprehensive, reasonably complete study of the bird life of marshes has been made. This is one of the strongest reasons why some marsh areas must be saved for future study.

Conservation of New York Marshes. New York State once possessed large marsh areas rich in wild life. The history of these marshes however was similar to most of those in other parts of the United States. For one reason or another their areas were drained, and as they were drained the wild ducks, rails, bitterns, gallinules, muskrats, snapping turtles and other interesting forms disappeared. Certainly this drainage, together with similar activities in many other places, has much to do with the growing scarcity of the wild ducks and rails that breed in marshes. The great Potter Swamp in Yates County was stripped of its timber for barrel staves, and the greater part of its wonderful bird fauna disappeared. The Tonawanda Swamp near Buffalo, an area partly wooded and partly open marsh, was drained and turned into farm land, and the naturalists of Buffalo no longer have this interesting area to study. In more central New York, in portions of Wayne and Cayuga Counties was the great Montezuma Marsh, a place where hundreds of Black and Wood Ducks nested, where Great and Least Bitterns, Gallinules and Rails brought up their young in large numbers, where Herons resorted to feed when nesting days were over, where shore birds congregated in large numbers in late summer, and where thousands of ducks of every inland species stopped to feed on their migrations every spring and fall. There was good hunting there regularly till the marshes were drained. Was it the hunter that drove the wild life out of this ancestral home?

It is to be regretted that our knowledge of the bird life of the Montezuma Marshes in the height of its glory is so slight. No one treatise on the birds of this area alone has been published to my knowledge, though scattered records from the area appear in certain publications (Reed and Wright, '09; Eaton, '10 and '14). From these records it is apparent that Mr. Foster Parker of Cayuga has a better knowledge than anyone else of the bird life that existed in the marshes before drainage.

Early in this century New York State began to contemplate seriously the construction of the Barge Canal. The Barge Canal must cross the Montezuma Marsh, and draw away its waters. Man must improve his commerce. The rights of wild creatures were not to be considered, and so the Montezuma Marsh was drained. The drainage took place, as Mr. Foster Parker has written me, about 1911, and a few years later the entire Barge Canal was completed and in working order. Portions of the marsh are drained, plowed, and producing good crops (Fig. 88). Other portions are drained

enough to remove most of the water and greatly lessen the wild life, but are still growing a few dwarfed cat-tails and other marsh plants, though it is difficult to find any other marsh birds than Red-winged Blackbirds and a few Bitterns in them. Possibly these areas will be cultivated in time.

North of the main area of the Montezuma Marsh, connected with it by marsh areas but draining northward through Black Creek rather than directly to the Seneca River, lies the Sink Hole Marsh. Fortunately this marsh was not affected by the construction of the Barge Canal and the area remains undrained. I understand that there has been in the past some talk of draining it and some surveys made with the idea in mind, but reports are that the cost of drainage under present conditions is prohibitive, a fortunate thing for the wild creatures living there, and for the nature lovers and scientists who would enjoy and study them.

Another area to the northward, not directly connected with the Montezuma Marsh, is the area about Muskrat Creek, Parker Pond and Otter Lake. Here also there has been some talk of drainage that has not materialized. The chief proposition here has been to drain Otter Lake from the south end into Muskrat Creek. I understand that this idea was given up since surveys reported that the fall from lake to creek was too little to bring about successful drainage. The question of the value of the land for agriculture in both these cases has not been considered. It is simply assumed that since the Montezuma and other drained marsh lands have proven productive that of course these areas will be. That is quite possible; but certainly, if we must come some day to draining them, let us be sure before we take the step, and destroy the last vestige of the marsh wild life of central New York, that the areas are actually going to be of greater value than the wild life can be made to be at present.

It is not too late to take steps to preserve for all time to come, one or both of these areas. If we can do this, we will have left areas that on a smaller scale represent the conditions that existed in the Montezuma Marsh in the days of its glory. Here, if we will, we can save a home for the marsh birds and animals, for the Black Duck, Mallard, Wood Duck and Blue-winged Teal, the Herons, Bitterns, Rails and Gallinules; a stopping place for the hosts of shore birds and ducks that come through from farther north; a place where many of us can get better acquainted with the lives of these marsh creatures, at present so little known even to orni-

thologists. To do this requires no costly constructions or improvements. The land is as we would have it. It merely requires the purchase of the land, and legislation to protect it. Certainly with the great areas of marsh that have been drained agriculture can spare this small area. We should certainly not let it be drained just because a few promoters see a chance for their own personal gain. To wipe out of existence such highly interesting creatures as the Least Bittern, Virginia Rail or Long-billed Marsh Wren would be a tragic mistake which man with his boasted intelligence ought to be above committing.

So long as Mr. S. C. Vanderbilt retains his interest in the conservation of muskrats and gives his marshes the rigid protection that they now have, that portion of the Sink Hole Marsh will remain an excellent area for most forms of marsh wild life. The portion of the Sink Hole Marsh east of Mr. Vanderbilt's holdings, extending from the southern boundary of the drainage of Black Creek north to and including Crusoe Lake, is an area that is similar in character, contains much wild life, and with protection should be equal to Mr. Vanderbilt's lands in this respect. If this area could be obtained by the State, and this seems entirely possible, it could easily be properly managed to become a perpetual marsh area, a home for the many wild creatures now in danger of extermination, a breeding ground for many ducks, rails and other game birds, and a place where the naturalist could study the life histories of these interesting creatures under unrestricted natural conditions. On the accompanying map I have indicated the area most suitable for a marsh wild life preserve.

DESCRIPTION OF THE MARSHES STUDIED

In New York ornithology the old Montezuma Marsh and the wonderful bird life that inhabited it have played an important part. Today the main area of this marsh has been drained by the construction of the Barge Canal. Areas ~~that~~ were once the breeding grounds of large numbers of ducks, rails, gallinules and bitterns are now plowed and cultivated (Fig. 88).

North of the main area of this former marsh are smaller areas that were not affected by the construction of the canal. Compared to the original marsh, these areas are small, but they still contain an abundance of marsh bird life. On the United States Geological Survey maps these areas are labeled "Montezuma Marsh." Though

originally connected with that body by unbroken marsh, this northern area is really distinct, and is known locally as the Sink Hole Marsh (see Map 6).

North of this area, and connected with it by areas of marsh, lies Crusoe Lake, a body of water entirely surrounded by cat-tails. Further eastward and northward, and not directly connected with these areas, are the marshes of Muskrat Creek, with the two bodies of water, Otter Lake and Parker Pond, at its head. West of the Sink Hole Marsh a small area has been created into marsh by the Barge Canal, and I have referred to this locality as the Clyde Marsh. These areas, and a small area farther west in the State about the Byron Mill Pond, are the ones in which this study of marsh birds was made. A few other trips were made to points that looked interesting on the maps but did not prove so when we reached them.

This study was made in the months of July and August, 1923. I had for a companion Dr. Chas. E. Johnson of the Roosevelt Station. Dr. Johnson was engaged in a study of the muskrat, and since his work and mine could be conducted on the same areas, we were able to work in company or near each other the greater part of the time. Although Dr. Johnson's chief interest was mammals, he is a good field student of birds, and I have been able to add to my report a number of observations made by him that are of particular interest. In certain other cases we happened to be together, so that his observations and identifications verify mine.

The work began on July 3, and from then until July 12 we made headquarters at Meridian, and studied at Otter Lake, Parker Pond, and the areas along Muskrat Creek. From July 13 to August 5 we had headquarters at Savannah and turned our attention mainly to the Sink Hole Marsh and Crusoe Lake. From August 5 to 14 we examined areas further west, all of these being disappointing except the small area about the Byron Mill Pond. From August 14 to 27 we made headquarters at Clyde and again centered our attention on the Sink Hole Marsh, Crusoe Lake and the smaller Clyde Marsh.

Otter Lake. This body of water (Fig. 89) is the largest of the marshy lakes or ponds that we examined. Except for a few points on the east shore, it is entirely surrounded by marsh or swamp and its shoreline is not easily approachable. The marsh consists mainly of cat-tails, with a few other plants such as arrow arum, pickerelweed, and swamp loosestrife. The swamp is a dense thicket of shrubs such as willow, red-osier dogwood, buttonbush and sweet

gale; the last forming, with swamp loosestrife, the water margin. This lake is known to ornithologists as the place where Mr. Frank Chapman ('00, p. 62) made his first camera studies of the Least Bittern.

Parker Pond. Parker Pond is rather similar to Otter Lake. It is smaller in size and rounder in outline. Its borders have a greater amount of marsh and a lesser amount of swampy thicket. South of this pond and just below its outlet is a red maple swamp (Fig. 92) in which there were indications of a colony of nesting Great Blue Herons, though the colony was not definitely located owing to the impassable character of the swamp.

Muskrat Creek. This stream flowing out of Parker Pond is surrounded by marsh or swamp-marsh areas along the greater part of its length (Figs. 90, 91), south nearly to Weedsport. These marshes are rather difficult of access, but are filled with interesting bird life. Marsh areas here are mainly cat-tail (Fig. 94), and swamp areas are largely maple swamp (Fig. 96), with a few areas of swamp thicket (Fig. 97), such as occurs about Otter Lake and Parker Pond. In many places marsh and swamp come together or are more or less mixed, cat-tail areas being broken by scattered growths of trees or shrubs (Fig. 95). Such conditions as this bring a greater variety of bird life than either the pure marsh or the pure swamp.

Crusoe Lake. This body of water is rather different from either Otter Lake or Parker Pond, the border being almost entirely surrounded by cat-tail (Fig. 98). The water is nowhere more than one to two feet deep. Here and there cat-tail islands (Fig. 99) stand in the midst of the lake, and in other spots great beds of water weeds grow so thickly that rowing a boat through them is extremely difficult, and the Spotted Sandpipers and Yellow-legs walk over their surface as if on dry land. While the water is not deep, the soft mud under the water is. At least our oars were not long enough to test its depth. The shoreline is practically impassable. Many of the clumps of cat-tails that seem firm sink slowly down if one attempts to rest his weight on them. Another peculiarity of this lake is that, in spite of the extremely dry summer, and a great change in all the surrounding marshes, the water level was essentially the same in late August as it was in early July.



Fig. 96. Wooded swamp, lower Montezuma Marsh. The trees are silver maples. July 19, 1923.



Fig. 97. Swampy thicket, near Muskrat Creek. A breeding ground of the Swamp Sparrow and Alder Flycatcher. July 9, 1923.



Fig. 98. The shoreline of Crusoe Lake. Cat-tail marsh at the water's edge.
July 13, 1923.



Fig. 99. An "island" of cat-tail in Crusoe Lake. July 13, 1923.

The Sink Hole Marsh. The Sink Hole Marsh is perhaps the most interesting area of all, containing a greater amount of bird life, particularly ducks, and being more easily accessible than the other areas. It is drained by a stream known as Black Creek (Fig. 100). This stream flows southward through the western portion of the marsh till it crosses the railroad tracks of the New York Central and West Shore Railroads. It turns east a short distance south of these tracks, then north again, recrossing the tracks till it joins the stream flowing from Crusoe Lake. The southern boundary of the Sink Hole Marsh is formed by the line between the drainage of Black Creek and that of the Seneca River and the Barge Canal. This line is not definitely marked, the marsh as one proceeds southward getting gradually drier, but still retaining an unbroken growth of solid cat-tail. This cat-tail growth characterizes the southern portion of the Sink Hole Marsh, and in places extends for several miles (Fig. 102).

Northward, small areas of shrubs, scattered trees (Fig. 93) and small groves begin to appear, these becoming more and more numerous until the marsh has become swamp. A short distance north of the railroad tracks the area is still largely marsh, but contains scattered trees and shrubs in sufficient quantity to give the very best conditions for a variety of bird life (Fig. 101). It is evident, however, that the marsh area is not gradually becoming swamp, but that the reverse is true; swamp areas are gradually becoming marsh. This is shown clearly by the fact that in places where there are no trees and have been none for a considerable time, there is beneath the marsh vegetation a layer of old logs and stumps. These increase to the northward, until every open space, pool, or mud-hole is surrounded by old logs (Fig. 105).

In many places throughout the Sink Hole Marsh occur open pools of water that are connected either indirectly or not at all with the stream. These pools (Fig. 103) dry up later in the summer, becoming mud-holes (Fig. 104), areas that are devoid of standing water, but are flat open expanses of soft treacherous mud of unknown depth. These pools and mud-holes are great attractions to bird life, some species remaining about the borders of such places all summer, others being found there while the pools contain water, but deserting to the stream when the pools dry up.

In this connection, however, it must be borne in mind that the season of 1923 was an unusually dry one. The differences between early July and late August were great. Perhaps these pools do not

dry up by the end of summer in every year. Food habits of marsh birds vary with the wetness or dryness of the marsh, and observations made this year might not be true in other years.

Black Creek, the stream that winds and twists through the Sink Hole Marsh, is a great attraction to bird life. It is a slow-moving, muddy-bottomed marsh stream. Its width varies greatly, being sometimes twenty or more feet, and at other times so narrow that a small boat is brushed on either side by the cat-tail borders. The surface of the water is covered, except in mid-channel where there is a slight current, by duckweed (*Lemna minor*) (Fig. 117). The water is largely filled with water weeds, by far the most abundant of which is bladderwort (*Utricularia vulgaris* var. *americana*).

This stream, where it flows through the heart of the marsh, teems with bird life. Making one's way slowly along it by boat is a thrilling experience to a bird lover. Herons and Bitterns fly out on either side; the cat-tails seem full of Least Bitterns and Rails; broods of young Gallinules scurry into shelter; Black Ducks fly out with loud quackings; and mother Wood Ducks lead broods of young to safety around the next bend in the stream.

The western portion of the Sink Hole Marsh is rigidly protected by its owner, Mr. S. C. Vanderbilt of Clyde. While Mr. Vanderbilt's chief interest is muskrats, which he conserves on this area, the protection extends to the marsh bird life, or at least all of it except such forms as the Marsh Hawk, which he believes harmful to the muskrats. It is due partly to this protection, and partly to the general inaccessibility of the marsh, that this area is so rich in bird life.

The Clyde Marsh. West of the Sink Hole Marsh and not far from the town of Clyde is a small area that was flooded rather than drained when the Barge Canal was constructed. This area had formerly been partially wooded. Dead trees and stumps stand in the water between patches of cat-tail and bur-reed (Fig. 106). This area proved of considerable interest, many Gallinules, and some Rails and Least Bitterns breeding in it. Green Herons bred commonly about its borders, and other herons, Wood Ducks and Black Ducks fed there in late summer.

The Byron Mill Pond. Early in August we moved westward, intending to examine the Bergen Swamp and the Tonawanda Marsh. We chose Byron as a town from which we could reach both areas. The Tonawanda Marsh had been largely drained. The Bergen

Swamp, though an interesting area, was entirely wooded and lacking in the species we wished to study. Our trip would have been unproductive were it not for the Byron Mill Pond.

This pond was a long, narrow body of water, situated in the town itself. With a road on one side and a railroad track on the other, it was much nearer to civilization than any other similar area we had seen. At its upper end there was a small area of marsh, and the water of the pond was shallow and the shores muddy. The lower end was deep and less marshy in character. Bird life concentrated about the upper end, and in spite of the nearness of civilization many interesting species were found.

The mud about the upper end of the pond was so soft and deep as to make it impossible to approach the shore closely. The chief vegetation of these shores was the common rush (*Juncus effusus*). Broad-leaved cat-tail occurs also in some parts of the area (Fig. 108). Scouring rush (*Equisetum fluviatile*) is commoner here than in other marshes we visited, and a large part of the marsh at the upper end is made up of grasses (Fig. 107), chiefly rice cut-grass (*Leersia oryzoides*), with smaller quantities of sedges (*Scirpus* and *Carex*).

Part of our success at this pond was due to the season, at the height of the southward shore bird migration. Shore birds were always in evidence at the upper end of the pond (Fig. 109) and a number of different species could generally be made out.

We found headquarters along the road by the Mill Pond, and this fortunately gave us opportunity to look it over morning and evening. In spite of the nearness of civilization, the railroad trains, people, houses, apple orchards and corn fields (Fig. 108), it was soon apparent that both Black Ducks and Wood Ducks fed on the pond, the Black Ducks mainly at night. The nearness of our headquarters made it possible for me to get out several mornings before daylight and reach a favorable spot at the upper end where I could watch the Black Ducks feed. Here I had a better opportunity to become intimately acquainted with the Black Duck and its feeding habits than I could have had in the wilder marshes.

Vegetation of the Marshes. The vegetation of the marshes consists largely of cat-tails, two species of which occur; the narrow-leaved cat-tail (*Typha angustifolia*) and the broad-leaved (*Typha latifolia*). Other plants that are common are arrow arum (*Peltandra virginica*), swamp loosestrife (*Decodon verticillatus*), bur-reed

(*Sparganium eurycarpum*), common rush (*Juncus effusus*), reed canary grass (*Phalaris arundinacea*), rice cut-grass (*Leersia oryzoides*), and purple nightshade (*Solanum Dulcamara*).

The cat-tails are by far the commonest and most important forms of marsh vegetation, covering large areas with a dense growth where they are often the only species growing. They form the shelter and hiding places of nearly all the marsh birds. Their stalks form supports for the nests, and the dead leaves, the stalks, and the down from the seeds form the nesting materials for many kinds. Insects that live upon the cat-tails probably form a large part of marsh bird food, but I do not know that any species of bird eats seeds, stalks or leaves of the cat-tail directly. The two species of cat-tail most commonly grow separately, but one may sometimes find them together (Fig. 111). In the Muskrat Creek marshes and in the Sink Hole Marsh, the narrow-leaved cat-tail (Fig. 110) was decidedly the commoner, but at the Byron Mill Pond only the broad-leaved species was found. The broad-leaved cat-tail is usually a little taller, while the narrow-leaved is more slender not only in leaf but in stalk and flowering head. There seems to be no great difference between the two species as far as most birds are concerned, but I believe the narrow-leaved is much preferred by the Long-billed Marsh Wren. I found in the construction of blinds from which to study that the narrow-leaved cat-tail was preferable, for, although the broad-leaved made more effectual concealment, the former, with its smaller, stiffer stems, was more easily thrust deep into the mud, so that it would stand upright even in a heavy wind.

The arrow arum (*Peltandra virginica*) grows about the edges of water, either pools or streams, in both the Muskrat Creek and Sink Hole Marshes. It is an extremely common plant wherever it can get sunlight in which to grow. It will not be found underneath dense cat-tails, but mainly in the open, about the edges of water, or in a clearing about a muskrat house. This plant forms a nesting site for some species; Rails, Gallinules, and evidently Black Terns, placing their nests at its base. In midsummer the fruits on it become heavy and bend the fruiting stalks over to the ground, or often under water (Fig. 112). In fall the fruits and seeds are reported to be a favorite food of ducks, both Black Ducks and Wood Ducks being reported to eat them. The fruits are said to break open and with the first frost scatter the seeds about over the ground.

The swamp loosestrife (*Decodon verticillatus*) is a most interesting and unique plant, forming an important part of the marsh vege-

tation. This plant grows chiefly in standing water along the edges of pools, ponds, or streams. It is really a semi-shrub, its lower base being woody and persistent from year to year, while its upper portion of long curving branches, overhanging the water (Fig. 113), is entirely herbaceous. These branches have magenta-colored flowers in the month of August. The woody branches at the base are covered with a thick, soft, spongy bark, the main part of which is as white and soft as the flesh of a fungus. Large clusters of this plant grow along stream borders, and the foot traveler in marshes will save time by going around rather than attempting to cross one of these areas. The water about them is deep, the mud is soft, and the tops of the woody bases of the plants irregular in shape and treacherous when one trusts the weight to them. A group of these plants overhanging a stream border (Fig. 115) forms a favorite place under which Rails, Gallinules and young ducks take shelter. Under their branches water birds may swim a considerable distance entirely concealed. Gallinules often climb up into the branches of this plant, and nests of the Least Bittern and the Kingbird were found in them. A Virginia Rail was observed feeding beneath the branches, and evidently catching insects in the foliage above its head. The plant was frequently parasitized by a species of dodder (*Cuscuta*).

The common rush (*Juncus effusus*) was found in all the marshes visited, but was most common about the Byron Mill Pond (Fig. 114). It often grows in solid masses over a considerable area, a common habit with many marsh species. In such cases it forms a dense cover, not so tall as the cat-tail, but an excellent hiding place for Gallinules, Rails, young Wood Ducks, and others. Marsh Wrens built their nests against its stalks, and used its leaves for nest material. Other species doubtless nest among the rushes about as frequently as among cat-tails.

The bur-reed (*Sparganium eurycarpum*) is another species that in some places forms good sized areas in which it is the only species. It often grows however mixed with grasses and sedges, and sometimes with the sweet flag (*Acorus calamus*), in which case the leaves of the two species are so similar that close observation is necessary to make out which plant is which. Like the other marsh plants it forms good shelter for marsh birds, and a support for nests, the Long-billed Marsh Wren, at least, building its nests in the stalks. The seeds are reported a common food of ducks in the fall.

The reed canary grass (*Phalaris arundinacea*) is a species that often grows as tall if not even taller than the cat-tail. It is fairly common and occasionally forms dense stands along stream margins (Fig. 116). It is, like other plants, a shelter for the marsh birds. I watched young Gallinules run under its shelter, and have heard Marsh Wrens singing from its depths. Its patches, however, are small in area.

The rice cut-grass (*Leersia oryzoides*) is fairly common in many places and forms dense stands not as tall as most of the other marsh plants. Its seeds are reported to be a favorite food of ducks in fall. At the head of the Byron Mill Pond a marsh in which this species was the most abundant plant, formed a daytime shelter to the Black Ducks (Fig. 107).

The purple nightshade (*Solanum Dulcamara*) is a plant that grows in many other places than marshes, and in fact is not commonly spoken of in botanies as a marsh plant. It was however very common in all the marsh areas we visited, in places growing under the cat-tail and climbing up through its stalks to the light. It was also common in open areas and in swampy thickets (Fig. 118). Its purple flowers were to be seen throughout the summer and its scarlet berries from early August, on. The berries are reported to be poisonous, at least to humans, but they are most certainly eaten in quantity by birds. In the marshes they are reported to be a favorite food of the Wood Duck, and I watched a Gallinule eat them. Dr. Johnson reported Ring-necked Pheasants frequenting the marshes and feeding on them in October. It is not probable that any wild berry is poisonous, at least to birds, for the purpose of the berry is to get itself eaten and its seeds distributed, and poisonous properties would defeat this purpose.

Other plants occurring in the marshes in lesser quantities than the above are as follows: Among grasses blue-joint (*Calamagrostis canadensis*) and a species of *Glyceria* were fairly common and probably furnish some food for ducks in their seeds. Reeds (*Phragmites communis*) occurred in a few places, but nowhere were seen to make the pure stand of this species that occurs in other regions. Sedges (*Carex setacea* and *C. trichocarpa*), other species of this genus and of *Scirpus* and *Cyperus*, were fairly common. At least three species of *Polygonum* (*P. hydropiperoides*, *P. pennsylvanicum* and *P. amphibium*) were found, and the first, at least, was quite common. The seeds of these species are all reported as duck foods. The swamp dock (*Rumex verticillatus*) is quite common scattered here and there through the marshes (Fig. 119), and its seeds are also



Fig. 100. Black Creek, in the Sink Hole Marsh. July 13, 1923.



Fig. 101. Another view along Black Creek, in the Sink Hole Marsh. August 16, 1923.



Fig. 102. Southern end of the Sink Hole Marsh. An unbroken expanse of cat-tail. The main Montezuma Marsh probably once looked like this. Photo July 16, 1923.



Fig. 103. A pool in the cat-tail marsh; a special attraction to marsh bird life. July 16, 1923.

important duck food, as are probably those of the broad-leaved dock (*Rumex obtusifolius*), less widely distributed but not uncommon. Several species of pondweeds (*Potamogeton*) were seen on marsh ponds and in places where there was open water. These are also important as duck foods.

Other species of plants that are not definitely reported as food for marsh birds or do not form any large part of the marsh vegetation are as follows: royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*) marsh fern (*Aspidium thelypteris*), water plantain (*Alisma plantago-aquatica*), arrowhead (*Sagittaria latifolia* and *S. heterophylla*), sweet flag (*Acorus calamus*), pickerel-weed (*Pontederia cordata*), blue flag (*Iris versicolor*), lizard's tail (*Saurura cernua*), yellow pond lily (*Nymphaea advena*), white water lily (*Castalia odorata*), tall meadow rue (*Thalictrum polygamum*), wild bean (*Apios tuberosa*), hairy willow herb (*Epilobium hirsutum*), cow parsnip (*Heracleum lanatum*), water hemlock (*Cicuta maculata*), swamp milkweed (*Asclepias incarnata*), dodder (*Cuscuta*), Joe Pye weed (*Eupatorium purpureum*), boneset (*Eupatorium perfoliatum*), and climbing hempweed (*Mikania scandens*).

LIFE OF THE MARSHES OTHER THAN BIRDS

In addition to plants and birds other life occurs in the marshes, and some of the forms have some influence upon bird life. Among mammals the muskrat (*Ondatra zibethica*) is the most conspicuous if not the most abundant. We found no evidence to show that this animal ever molested birds, or their nests or young, though it is sometimes reported to do so. It is true that birds were sometimes startled by its sudden appearance, as related further on, but this in my opinion was likely to be because the animal is not instantly distinguishable from a mink or other form that would be an enemy of bird life. The indirect effect of the muskrat on bird life is caused by its habit of cutting cat-tail and of cutting runways through the marsh. About muskrat houses the cat-tails are removed, making an open spot. This appears to be what attracts the Black Tern to the marsh. I believe the occurrence of the Tern in the Sink Hole Marsh, and the scarcity of the bird in other localities, is due directly to the protection of the muskrat in the Sink Hole Marsh, and its scarcity due to unlimited trapping elsewhere.

Minks, and probably weasels, occur in the marshes, and are undoubtedly destructive at times to bird life. We saw no direct evi-

dence of these animals, but a young Least Bittern, the remains of which were found, was probably destroyed by one. Skunks certainly occur about the borders of marshes whether they go into the marshes themselves or not. So far as known they have no direct effect on bird life, though they might possibly destroy eggs if they found the opportunity. That they do destroy eggs of the painted turtle in considerable numbers, there was abundant evidence in the shape of egg shells dug up and the contents eaten. Probably this habit also applies to eggs of the snapping turtle. Since the latter is harmful to young ducks and Gallinules, the skunk would then be indirectly beneficial.

Field mice (*Microtus*) were common in many places about the marshes, and form a large part of the food of the Marsh Hawk. They are reported eaten by some of the herons. At the Byron Mill Pond I caught sight several times of a cottontail rabbit hopping over the soft mud at the edge of the pond, under the shadow of the rushes and scurrying back in among the rushes when it saw me. Perhaps some of the marsh vegetation had attracted it. One does not commonly think of the cottontail as a marsh inhabitant.

Three reptiles are common in the marshes, the water snake (*Tropidonotus fasciatus sipedon*), the snapping turtle (*Chelydra serpentina*) and the painted turtle (*Chrysemys marginata*). Water snakes are abundant. This was particularly true about the borders of ponds, when boat trips revealed hundreds sunning themselves among the cat-tails. They may occasionally be harmful to bird life, but all the evidence we found showed that their food was chiefly if not entirely fish and frogs. This is in agreement with the reports of others (cf. Evermann and Clark, '14). Snapping turtles were perhaps least common of these three reptiles, and this is fortunate as they are the only ones doing considerable harm to bird life. Painted turtles were extremely abundant, and one of the characteristic forms of life in the marsh wherever we went. When waiting at a blind, they were usually the first form of life to appear. The monotony of a long wait was often relieved by watching their heads pop out among the duckweed of the water surface, or watching their slow labored climbing to get a favorable spot on a log or on the bank of the stream.

The commonest frog of the marshes appeared to be the leopard frog (*Rana pipiens*), while the green frog (*Rana clamitans*) was not uncommon. These animals probably furnish food for the larger herons. Fish occurred commonly in the waters of ponds, lakes and streams, and were the attraction to herons, kingfishers and some

other birds. What species occurred in the marsh streams was not determined. I have mentioned later on the bullhead and the sunfish as being eaten by certain birds, but neither of these cases was in the marsh itself. The small fish caught by Kingfishers and Least Bitterns in the marsh stream were unidentified. In Crusoe Lake there were some pike or pickerel, and probably carp. People were continually fishing at Otter Lake, Parker Pond and the Byron Mill Pond and obtaining perch, bass, pickerel and pike-perch. These species, however, probably have little effect on the bird life of the marshes, though it was probably one of these larger fish that brought the Osprey to Crusoe Lake.

METHOD OF STUDYING THE MARSH BIRDS

The purpose of my study was to learn not only where marsh birds could still be found in abundance in central New York, and what species could be found, but also to obtain all the facts concerning their lives and life histories that could be obtained in the time and season available for study. It is difficult in field ornithology to accomplish both of these things at the same time. In exploring areas and finding as many species as possible, but little is learned of life histories. Birds are seen mainly under disturbed conditions, on the alert or actually flying away because of the approach of the observer. In the study of habits one must concentrate for a long time on one or two species, so that the number of species observed and the area covered is much lessened.

For the first two or three weeks we visited and explored marsh areas, covering much ground and finding all the species that could be expected to be at all common. At the end of that time very little information had been obtained on habits and life histories. Ducks particularly had been seen mainly when flying away. Other species had been seen mainly as passing glimpses. The common marsh birds had all been seen, but I possessed an intimate knowledge of none.

Therefore after this time the method of work was gradually changed. Instead of tramping through a marsh, I went as quietly as possible to a spot where I could conceal myself on the edge of a pool of open water. After a little experimenting I found that a good blind could be constructed of cat-tails, that more of these plants could be bent down to form a reasonably dry seat, that one could even prepare a bed of bent-over cat-tails on which he might lie down without getting wet. Once the blind was made, the rest was a matter of patience. Fortunately mosquitoes were only mildly annoying

As summer advanced they became less and less abundant. There was nothing to combat save one's own tendency to impatience.

To one who has never tried the study of birds by patient quiet waiting this method may not appeal. To stop and sit and wait for an hour in a spot where no birds are to be seen, when one might find several species by moving around the next bend of the stream, may seem highly futile. But to one who has given the method a fair trial it not only appeals, but it becomes more and more in his mind the only method of real field bird study. The results from day to day grow more and more interesting until one's mild interest becomes wild enthusiasm.

A marsh is well adapted to this sort of study. Birds congregate about the edges of open water to feed. Cat-tails can be made to form an excellent natural blind that needs little fixing or repairing to hide the observer. Other vegetation will also make blinds where cat-tails are not abundant. Bushes, ferns, grass, rushes, swamp loosestrife, and a bed of water pepper were all used as blinds with greater or less success. All but the loosestrife and water pepper are to be recommended. The stumps of loosestrife form a most uncomfortable seat where one's feet must be always in water, though the leaves give excellent concealment. The water pepper when bruised fills the air with something, one could hardly call it an odor, that causes the eyes to smart and the nose to tingle, particularly on a hot summer day.

Once established in a blind, with glass, note-book and camera ready, the rest is a matter of patience till the birds appear, and of restraining one's desire to move, to cough, or change to a more advantageous position once they have appeared. The monotony of a long wait can be relieved by watching the other life with which the marsh teems. Dragon-flies are constantly on the wing. Other insects are found in large numbers. A group of whirligig beetles gyrates on a pool. The first painted turtle gets over the fright caused by one's approach and pokes its head above water. Soon another is clumsily climbing to the top of a log where it may sit in the sun. Gradually more and more come, and we count them till the log is covered, and the mass of floating duckweed is checkered with their heads. A Virginia Rail pokes its head through the cat-tails ten feet away and commences to probe the mud. The first bird has appeared. The period of waiting is over. From now on, if we can remain quiet, birds will be all about us. Gradually they come; a Gallinule or two swimming out into the open from the shore; a Least Bittern that suddenly appears from nowhere; a Green

Heron that flies down the creek and alights on a log nearby; and then a Wood Duck that swims around the bend of the stream.

Complaints have often been made that colored plates, such as illustrate this publication, are unnatural, in that they group a large variety of species in a small space. One who studies marsh birds from a blind, however, learns that they are not so far from the truth under these conditions as they would seem to be. Once in the Sink Hole Marsh I had six species in the field of my glass at one time, no one of which was more than a hundred feet away. A Black Duck was sleeping on a stump. Eight Blue-winged Teal were swimming or resting near, not all of which however were in the field of the glass. With these were two Wood Ducks and a Gallinule, while a Sora and a Least Bittern were feeding near. Nearby, but not in the field of the glass at one time, were Black Tern, Killdeer and Yellow-legs, and both Green and Great Blue Herons appeared from this point later. On numerous other occasions similar conditions obtained. At the Byron Mill Pond the shore birds were often so congregated that several species might be observed in a group together. The great abundance of bird life in a marsh is not suspected by walking through it. It is only when one sits and waits quietly that he learns something of the number of birds about him.

Bird photographers have frequently tried patient waiting in a blind to get their results. Most of them, however, have had some attraction such as a nest, or a special feeding spot to bring the birds near the camera. In this study, while it was desired to get photographs, these were not the final aim. At each spot where I made a blind, I set up the camera, and focused it on a likely looking spot. If birds did not come near this spot, I still got results in field notes and sketches. If a bird did happen on the spot I could make best use of the opportunity. The pictures thus obtained are not to be compared with some of the fine close-up work that bird photographers are now getting. In most cases the birds were rather distant. But in one or two respects the pictures have an advantage. They show not the bird simply, but its surroundings and environment. The bird is usually not frightened, or aware of the near presence of man, and is behaving naturally.

It is impossible to photograph a wild bird under all the conditions that we might desire. The chance for a photograph must be taken as it comes. To picture a bird feeding under its various different methods, or bathing, preening, flying, walking, etc.,

would be impossible. Yet one sees all these as he watches the birds. It is often difficult to draw a word picture of just what one sees, that will give the reader a real idea of how the bird looked when photographic work was impossible. There is, then, one other method of recording these things, that of sketching. For this reason the outline field sketches have been included.

The voices and calls of the different species have been studied by collecting a number of records according to a method I have previously published (Saunders, '15, p. 173). The descriptions given are based on a study of these records. The words used in syllabic representations of calls have been made as nearly like the sounds as I heard them as the English alphabet will permit. The vowel sounds have been used to conform to changes in pitch, the broadness of the vowel denoting the lowness of the pitch (cf. Hunt, '23, p. 203).

NOTES ON THE BIRDS OBSERVED

PIED-BILLED GREBE. *Podilymbus podiceps* (Linnaeus)

Occurrence. The Pied-billed Grebe was rather scarce in the marshes visited. It was seen in but four places all summer. Several birds, at least four, were seen on Muskrat Creek, in Cayuga County, but in only one locality, at a road crossing of the creek, about one mile south of Parker Pond. Some of these birds were adults and some young with striped heads, but nearly full grown. They were seen July 3, 7 and 9. One bird of this species was seen in the Sink Hole Marsh July 23, and again at practically the same spot August 16. At least one bird was seen on the Byron Mill Pond from August 8 to 13, and four birds were observed on Crusoe Lake August 24.

Habitat. These birds prefer places where there is considerable open water and the vicinity of floating water weeds. Their scarcity in the region is probably due to the fact that there is little open water in most of the marshes. The points in the Sink Hole Marsh and on Muskrat Creek where the birds were observed were places where there was more open water than in most of the marsh. It was rather surprising that this species was not seen at Crusoe Lake except at the last visit late in August, for the lake would seem to be good territory for it. Possibly the water is too shallow to suit it. The four birds that appeared there August 24 seemed to be birds that had come in from elsewhere, as they flew in to a point in sight from my blind a little



Fig. 104. A pool in late summer dried to a mud-hole. The old logs indicate that the area was once wooded swamp. August 28, 1923.



Fig. 105. Another pool in the marsh. The edges of such pools are excellent locations for study of bird life from a blind. August 28, 1923.



Fig. 106. The Clyde marsh on a windy day. This area was created into marsh by flooding due to the Barge Canal. August 19, 1923.



Fig. 107. Marsh at the head of Byron Mill Pond. A daytime hiding place of Black Ducks. August 13, 1923.

after noon, and had neither been seen at any time during the morning nor on another day when working in this same vicinity.

Feeding Habits. This species was observed to feed sometimes by immersing the bill and head as ducks do, and sometimes by diving, using the latter method more frequently where the water is deep. No opportunity occurred to determine the character of its food.

General Habits. This species is evidently quite local in habits, remaining in one small place throughout the summer. This seemed to be the case with all the birds except those seen at Crusoe Lake that may have already begun their fall migration. The bird at the Byron Mill Pond was observed most frequently. It seemed little afraid of observers, but was nevertheless out of sight a large part of the time. While I do not think it left the pond while we were in the region, it was often not to be seen anywhere on its surface.

While this bird and the one in the Sink Hole Marsh were solitary, the others seemed sociable and fond of each other's company. The birds on Muskrat Creek were seen day after day sitting in almost the same identical spot in the water. The Crusoe Lake birds were the only ones seen to fly at all. No bird of this species was heard to make any sound. The birds at Crusoe Lake associated more or less with the Gallinules feeding there, but not with the Black Ducks. While they fed most of the time that I was watching them (Pl. 19, Figs. 4, 5), when hunger was satisfied, like most of the other marsh birds they spent much time in preening the feathers (Pl. 19, Fig. 3).

An interesting point comparing the habit of this species with others was observable at Crusoe Lake when Dr. Johnson rowed up the lake to the vicinity of my blind. On his approach the Black Ducks flew away, the Gallinules took refuge in the surrounding cat-tails, but the Grebes merely swam slowly away up the inlet of the lake.

BLACK TERN. *Hydrochelidon nigra surinamensis* (Gmelin)

Occurrence. Black Terns (Pl. 7, Figs. 5, 9) were found in only two localities, both in Wayne County. A single bird was seen at Crusoe Lake, July 13. A colony of at least seven or eight pairs bred in a portion of the Sink Hole Marsh, and birds were observed there from July 16 to August 3. When first observed there were fifteen or sixteen adult birds to be seen at one time, but later the numbers diminished, till by August 3 only two birds, an adult and a young bird, were observed. Upon returning to this area August 18 this species had gone.

Habitat. While the Black Tern is an inhabitant of cat-tail marshes, it evidently prefers open spots in these marshes, and does not occur in dense cat-tails. Over a certain area of the Sink Hole Marsh the cat-tail had been destroyed (Fig. 120). The destruction was not complete; in the earlier part of the summer the ground was bare of live cat-tails, but covered with dead stalks, and interspersed with plants of the arrow arum, which had come in because of the lack of shade. Muskrat houses were numerous on this area, and here the Black Terns evidently bred. In August the bare area was becoming green again with new shoots of cat-tail. Evidently the condition that brings Black Terns in numbers to a marsh is a temporary one, and the birds must move to new breeding places as conditions change.

Nesting. No nests of the Black Tern with eggs were found, but several empty nests that were probably used by them were discovered. These nests were not on muskrat houses, where other observers have frequently found them, but situated at the bases of arrow arums (Fig. 121). They might possibly have been nests of Gallinules or Rails, rather than Terns, but they seemed small for Gallinules, and of coarser materials than any Rail nest I have seen. They were also in a more open situation than either of these species is likely to choose. They were constructed of cat-tail leaves, and were flat with only a slight hollow. Several nests were only a few feet apart. Near two such nests we found, on July 17, three downy young that could not have been many days old (Fig. 122). On the same date other young birds, full grown, in the white plumage (Pl. 7, Fig. 9) that distinguishes them at this season from adults, were flying perfectly. Other well grown young were seen up to August 3.

Care of Young. The parents show great concern at the approach of possible danger near their young. Whenever we entered the marsh they flew about us, calling excitedly, and when we neared the young, dived at our heads, often coming within a few feet. Flying through the air, they stop when they come over the young and hover, with head and bill pointed downward, feet hanging down and wings flapping straight up and down (Pl. 8, Fig. 2). This hovering is also evidently indulged when they see or search for some object of food in the vegetation beneath. They show concern for the young and bring them food, some time after the latter appear to be full grown and are fully able to fly.

Habits of the Young. The downy young are able to move

slowly about over the marsh when only a day or two old. They evidently leave the nest soon after hatching. They hide expertly beneath vegetation, and their dull brown, black-spotted coloring makes them extremely difficult to find. They show no fear when handled at this age, but open their mouths for food much as do young passerine birds in the nest. When older and able to fly and perch, they still remain a large part of the time on the ground, crouching and waiting for the parent to come with food (Pl. 8, Fig. 3). At such times their white colors make them the most conspicuous birds in the marsh, and for a bird that sits still most of the time, they are easily discovered.

Feeding Young. When the parent approaches with food the young lift the head and follow its flight (Pl. 8, Fig. 7) calling "keeyah keeyah" in a high-pitched, but harsh voice. The sound is much like the last part of the Killdeer's call, and when I first heard it, I thought it a Killdeer with an unusually harsh voice. When the young are small and downy, the parent lights on the ground beside them to feed and remains for some time, but just what takes place I was unable to see. When the young are well grown, the parent merely swoops down and drops the food near (Pl. 8, Figs. 8, 9), the young bird promptly picking it up and swallowing it. The young of a brood, while in the near vicinity of each other, do not stay close together. The three downy young we found were originally scattered, but all within a radius of ten feet. Older birds being fed by the same parent were twenty or thirty feet apart. If they should remain near each other, the parent's habit of dropping the food would cause fighting among them.

Food. The only food that the Black Terns were seen to capture and feed to the young was apparently a worm or insect larva two or more inches long, and nearly a quarter of an inch thick. When this food was carried to the young in the bill, its shape, silhouetted against the sky, curving downward from the tip of the bird's bill, could be plainly seen. It always looked black, but this was to be expected, seen in such a position, and its real color may have been quite different. I believe the parents obtained this food in the cat-tails rather than in the more open portions of the marsh. If this is the case, it is a reversal of many birds' habits, the birds nesting in the open and feeding in vegetation, rather than nesting in the vegetation and feeding in the open. In the Sink Hole Marsh I never saw birds feed over or dive to the water surface,

feeding young at the time, so that evidently the moult begins before feeding of the young ceases.

Seasonal Movements. Terns evidently begin to leave the nesting grounds in July as soon as the young are able to fly. On July 16 seventeen birds were counted in the Sink Hole Marsh, only one of which was in juvenile plumage. From that date on, the numbers grew less and less, more birds in juvenile plumage appearing on the wing, until on August 3 there were left only one adult and one young bird. Returning to the area on August 16, after a trip to points farther west in the State, no Black Terns were to be found. Whether fall migration began immediately, or the birds went to some other feeding ground for a time, I could not be sure. I hoped to find a few at Crusoe Lake in the latter part of August, but my hopes were not realized.

BLACK DUCK. *Anas rubripes* Brewster

Occurrence. The Black Duck (Pl. 6, Fig. 1) is a fairly common summer resident in the marsh areas studied, and the most abundant breeding duck. Individuals were seen in practically all localities visited, and after some acquaintance with their habits and preferences, it was not difficult to find numbers of the birds, and with patience to study their habits. In early summer, when nesting or caring for small young, they were most abundant in the Sink Hole Marsh. In late summer the greatest numbers were found on Crusoe Lake (Figs. 123, 124).

Habitat. For nesting and summer feeding places the Black Duck must have marshes containing standing water, such as pool, pond or creek, well stocked with water weeds. For the best conditions they should be remote from civilization, or not easily accessible to man. The open water should be surrounded by vegetation such as cat-tail, rushes, tall grass or shrubbery in which the young can take refuge when too small to fly. There is some difference between areas chosen for breeding and those chosen for late summer feeding. In late summer, when the young are able to fly, birds become less numerous in places where they bred, and increase in other regions where they were scarce in the breeding season. Thus, in the Sink Hole Marsh, birds were abundant in July, both adults and young of various ages. At Crusoe Lake at the same time only one brood of young was seen, and two adults without young, probably drakes. In August, few Black Ducks could be found in the Sink Hole Marsh, but from one to two hundred were seen on each visit to Crusoe Lake. The reasons

for these changes seem to be that the Sink Hole Marsh contains a larger area of marshy vegetation suitable for nesting and hiding of small young, while Crusoe Lake contains a greater variety of water weeds, and more open water where birds that can fly may feed in safety.

In late summer the habitat often varies between day and night, birds moving from one place to the other after sunset in the evening and a little after sunrise in the morning. The conditions that make day or night feeding places vary in different regions. Crusoe Lake was evidently a daytime feeding place, the birds coming in during the early morning, and leaving after sunset. They apparently spent the night in marshes to the south, perhaps some of them in the Sink Hole Marsh. I watched flights of birds heading toward Crusoe Lake in the morning, and was told by those who lived near the lake that they could observe flocks leaving the lake for points southward every evening. Crusoe Lake, being shallow everywhere, and with water weeds in many places, is evidently a good daytime feeding place because the birds can feed some distance from shore, and can see the approach of danger in any direction. Why they should not remain at the lake all night is not so easily explained.

Another late summer feeding place was the Byron Mill Pond. I was surprised to find the Black Duck feeding regularly there, because the place was so close to civilization. This, however, outside the hunting season, may have made greater safety rather than less, for if any individuals choose to hunt out of season, and there are a few such, they would not try it near civilization where their movements could be seen and gunshots be heard. At this place the birds fed on the pond, chiefly near its upper end at night (Fig. 109) or in the early morning, and retired for the day to the shelter of the marsh at the head of the pond. I could always find Black Ducks feeding here, and observe them without their suspecting my presence, by going quietly to a certain hiding and observation point before daylight.

Soon after sunrise these birds all left for the marsh at the head of the pond, some swimming up the creek and others flying the short distance. This marsh was not large, but consisted of a small clear stream (Fig. 107) with grassy edges. The grass was chiefly rice cut-grass (*Leersia oryzoides*), and it formed a good hiding place along the water's edge. The area was protected from approach on one side by an almost impassable marsh, and on the



Fig. 108. View across the Byron Mill Pond. The apple orchard and road show its proximity to civilization. August 10, 1923.



Fig. 109. Extreme upper end of Byron Mill Pond. A Spotted Sandpiper and a Killdeer in front of the border of rushes (center of view). Here Black Ducks were observed feeding and bathing in early morning. August 10, 1923.



Fig. 110. Narrow-leaved cat-tail, the chief vegetation of the marshes, July 18, 1923.



Fig. 111. Narrow-leaved and broad-leaved cat-tails growing together, July 20, 1923.

other was hidden from the road by a cornfield. Approaching through this cornfield in the daytime, I could nearly always find Black Ducks, but the noise I made, rustling against the leaves of the corn, which I could not entirely avoid, usually frightened the ducks out before I could observe them to any great extent. In spite of the nearness to civilization I doubt if the inhabitants of Byron knew that the Black Ducks were feeding and hiding in this locality.

Nesting. Work on the marsh areas began too late in the year to find nests of the Black Duck. Eggs were evidently all hatched before July 1 and broods of young were well grown at that time. Some broods seen in July, the latest July 26, were still unable to fly, but others that could fly were seen as early as July 6 at Parker Pond. No small downy young were seen at any time. One should probably look for nests in this region in April, May, or at the latest, early June.

Care of the Young. Up to the time that they are able to fly, young Black Ducks are generally seen with the parent. The parent bird keeps watch for danger while they feed. When danger approaches the parent signals the young with a soft, but sharp and quick quacking. But when the danger is close and the bird surprised, a loud and sudden "qua-ack qua-ack qua-ack" is used. At either signal the young scatter to the nearest shelter, cat-tails, grass or bushes, while the parent flies if the danger is close, or swims off into the open, with the evident intent of distracting attention from her young and attracting it to herself. One bird at the head of Crusoe Lake led us in our boat to follow her some distance up the inlet, Butler Creek, before she finally flew. After flying off a little distance she circled and returned to the lake and her young.

Feeding. The Black Duck feeds in shallow water among water weeds, swimming or wading as the depth requires. It feeds by three methods: scooping the surface with the bill (Pl. 9, Fig. 2); submerging the bill (Pl. 9, Figs. 5, 7) or the bill and head; and tipping up (Pl. 9, Fig. 8). In the Sink Hole Marsh and at the Byron Mill Pond the water was not deep enough to require tipping up, but at Crusoe Lake the birds tipped up frequently. In feeding, the birds keep in close company, two or three to a dozen or more following each other about. When they do not suspect danger they feed continuously and rapidly with heads under the water a large part of the time. When there is a large number, one

or more birds are likely to have their heads out on the watch for danger. The others are quick to respond to a warning quack, lifting heads and becoming instantly on the alert at the soft short quack, or immediately taking wing at the sudden loud startled one. They undoubtedly feed in company because it is safer. One duck alone, or a small company, is always easier to approach than a large flock.

Food. It is a difficult matter to determine definitely the food of a bird in the field, particularly when it feeds chiefly with its head and bill under the water. I was unable to determine any food of the Black Duck by observation. I suppose that water weeds make up a large part of the late summer food, and with them are probably insects, mollusks or other forms of animal life that live among the water weeds. Many plants that grow in these marshes are reported food of Black Ducks and other species, but this is chiefly in fall when their seeds are ripe. Most of these plants are not used as food in the summer.

Voice. The quack of the Black Duck is not distinguishable, at least to my ear, from that of the Mallard, or of the ordinary breeds of domestic ducks. I can offer no personal notes on the difference reported to exist in the voices of the two sexes. The quack differs on different occasions. Two quacks may be considered warnings of danger. The first is short, quick and not loud, given when a bird becomes suspicious of something. It seems to mean "Be on your guard!" At its sound the whole flock will lift heads and necks to the alert position. In this position the neck is in a straight vertical line, holding the head as high as possible (Pl. 9, Fig. 4), and the sharp eyes watch carefully for the least sign of danger. The observer who wishes to study habits of Black Ducks should be careful to make no sound or motion when the birds he is observing assume this position, or further opportunity will be gone. Neither the Wood Duck nor the Blue-winged Teal was observed to take a similar position to this, though they were observed under conditions when they might have been expected to do so, were it habitual with them.

The second quack used as a warning of danger is sudden and loud, and used when the bird is startled by close danger. Its meaning is evidently "fly at once," for the whole flock takes wing at its utterance. A single duck that has strayed some distance from the main flock will often fly suddenly from what it considers danger without quacking, when the rest of the flock will not fly.

Other notes are used that evidently have no relation to danger.

One of these is a loud call, beginning with the long quack, slurred downward, and followed by five or six shorter quacks, not slurred. "Qua-ack quack quack quack quack." What is the significance of this call is not easily made out. One bird in the Sink Hole Marsh kept it up over and over one evening. I tried answering with an imitation. The bird answered by calling again, but did not change its position. Later I tried this call when Black Ducks flew over the blind where I was concealed, and succeeded in making them circle about me two or three times, but not alight.

Still another note to which no special significance can be attached is a low gabbling indulged by a flock when feeding and preening together. The single notes vary up and down in pitch, and the general effect is like that of distant conversation in a room full of people. I heard this note only at Crusoe Lake where the birds were well out from shore and could see the approach of danger, and where attracting attention by noise would not subject them to danger. In the Sink Hole Marsh, and at the Byron Mill Pond, where enemies might approach closely without being observed, they fed entirely silently. At such times they must keep ears alert for any sound loud enough to stand out above the rustling of the cat-tails in the wind, as well as eyes watchful for movement. Such a sound immediately brings every head in the flock to the alert position.

Bathing. Frequently a flock of Black Ducks that I had watched feeding would, when satisfied, cease feeding and bathe. Birds about to bathe would choose a spot where the water was clear from weeds. They would immerse the head, and throw it up suddenly in such a way as to throw a stream of water over the back, and to wet successfully all the feathers of the back and wings. At the Byron Mill Pond I watched this bathing just after sunrise, when the sun threw long slanting rays that lit up the water with a silvery appearance. I could easily see the silvery stream flow over the birds' backs, leaving drops adhering here and there to the feathers.

Preening. After such a bath the birds get rid of surplus water by vigorously flapping the wings, shaking the head and tail, and then by preening (Pl. 9, Fig. 11). The bird turns its head back and preens between the wings on the shoulders (Pl. 9, Fig. 9), reaching first on one side of the back, then the other. Then they lift the wings one at a time, and preen beneath them. They preen the breast with the bill (Pl. 9, Fig. 12) and reach the neck, chin and sides of the head with the foot (Pl. 9, Fig. 10), vigorously scratching here and there wherever the bill cannot reach. In the Sink Hole

Marsh, and at Crusoe Lake, this preening commonly took place about noon. When it is over the inclination of the birds is to rest or sleep, and if not disturbed they do so. At the Byron Mill Pond birds retired to the marsh after bathing, and just what they did there I was unable to determine.

Resting takes place preferably on a stump, hummock of grass or similar spot where the bird can get out of the water. Where there are no such spots, or too few for the flock, birds rest sitting on the water. The head is turned back and the bill tucked between the wings on the shoulders (Pl. 9, Fig. 15). The eye usually shows above the feathers, and only once or twice did I actually catch a bird with its eyes shut. Whether the bird is asleep or merely resting, its eyes are open, and even at this time it is difficult to approach.

Flight. The flight of the Black Duck is swift and commonly accompanied by a whistling noise. The neck is outstretched and the head usually held pointing a little downward. Ducks are unable to change their course or check their speed as quickly as longer-winged birds. They are excellent fliers for speed in a straightaway course, but when going fast it takes them some time to check their speed or change their course to any marked degree. As they come in to a pond or pool to feed they set the wings and "scale" downward in a curved path, lifting the head up and striking the water with the breast as they come down. If other ducks are not already feeding there they circle about two or three times before alighting. Flocks move together at such times, the birds wheeling and circling as one, yet there is no definite leader among them. They even set the wings to scale downward all together. One time, when a flock came in at the Byron Mill Pond, and all set the wings together in this way, a sudden loud whir was instantly audible, a sound like that of a large electric fan. The birds had come from a distance and at great speed. Perhaps they twisted the feathers of the wings to break their speed.

In short flights birds do not scale down into the water, but drop straight down with wings flapping and feet lowered. Feet are lowered when rising from or dropping into the water. At all other times they extend back against the under side of the body. Sometimes birds rise from the water on a long slant, half swimming and half flying till they get started. At other times, they rise straight up from the water. The first method is used when flying from danger, but the second when making a short flight in which great speed is not attained.

Playing. When flocks are feeding in comparative safety, and bathing and preening are over, birds indulge in certain antics that can be considered nothing but pure play. A bird suddenly lowers the head, and pointing it straight forward (Pl. 9, Fig. 13) darts along the water surface in a straight line, splashing and churning the water with its feet as it goes. They go in this way a distance of ten or fifteen feet, then stop, rest a bit and do it over again in a different direction. At Crusoe Lake I have seen as many as eight or ten birds engaged in these antics at once, each one apparently independent of others, though probably the action is aroused in one bird by watching another.

Fighting. Birds that feed in flocks are probably always subject to slight quarrels between individuals. In late summer when mating and nesting are over, one cannot attach any particular biological significance to such fights. At this time fights can neither be over mates nor territory. Yet all the birds of the marsh that were at all gregarious were observed to fight more or less.

The Black Duck fights when birds feeding with heads under water bump into each other as they often do. Probably there is a difference in the belligerence of individuals, but when birds collide one bird usually aims a blow at the other with its bill, and the other retires rapidly. Sometimes the belligerent bird chases the other away (Pl. 9, Figs. 13, 14), when the attitude assumed is much like the one used in playing. Once at the Byron Mill Pond a clash took place where both birds were of belligerent nature. They rushed at each other and grasped each others' bills, and with breasts touching they pushed and shoved for several minutes before releasing their holds and going back to their feeding.

General Habits. The Black Duck is the most wary of the three species of ducks breeding commonly in New York marshes; in fact I doubt if there is another North American species that is more cautious and constantly on the lookout for danger. It is the most difficult species of bird to observe and photograph in the marshes. I have already mentioned the alert position it assumes when on the lookout for danger. With this position it often holds the wings high in a pose like that of a swan (Pl. 9, Fig. 3). Normally the wings fold together, making a horizontal line along the back, their tips coming just above the tip of the tail (Pl. 9, Figs. 1, 2). In the swan pose the tips of wings and tail are far separated.

The Black Duck seems entirely independent of other species of birds. Other species, however, are not so independent of it. Wood

Ducks, Teal, Mallards and Gallinules were observed associating and feeding with it, these species probably finding greater protection from danger when in company of the wary Black Duck.

Color Characters. Adult Black Ducks were frequently observed throughout the summer with bright red legs. If there are two subspecies of Black Duck, then the red-legged one is certainly the one breeding in central New York. Color of legs could be seen not only in flight, but when birds were feeding in shallow water, where they often lifted the legs from the water as they progressed (Pl. 9, Fig. 6). When preening after a bath they often scratched their heads and necks with one foot, and when light conditions were right in such cases the color of the legs was easily made out. Birds were often seen that had dull-colored legs, probably green, though the exact shade of such a dull color is less easily made out than red. These birds with dark legs were usually lighter in general color of plumage, a characteristic of young of the year, and an indication that green-legged birds in this region were always young ones.

BLUE-WINGED TEAL. *Querquedula discors* (Linnaeus)

Occurrence. The Blue-winged Teal (Pl. 7, Fig. 1) is least abundant of the three species of ducks commonly found and probably breeding in the New York marshes visited. It was found in only the Sink Hole Marsh and at Crusoe Lake. In the latter locality birds were seen only in late summer after the breeding season, on August 17, and again by Dr. Johnson on August 24. In the Sink Hole Marsh they were first noted July 23 and at numerous dates after that time. In this locality the greatest number of birds seen at any one time was eight, and I believe this number is very nearly if not quite the total number of birds that were in that marsh. At Crusoe Lake fifteen birds were seen at one time.

Habitat. So far as could be learned the habitat of this duck is in every way similar to that of the Black Duck. Wherever found Black Ducks also occurred in greater numbers, but there were many places where Black Ducks were seen but no Teal.

Nesting. Nothing definite could be learned of the nesting of this species, save the probable fact that it nests early. All the birds seen were full grown, and while it is probable that most of them were young of the year it was not possible to distinguish young and adults in the field.

Feeding. These birds fed in every way like the Black Duck, skimming the water (Pl. 19, Fig. 12), immersing the bill, immersing the whole head, and tipping up. In the Sink Hole Marsh, where the



Fig. 112. Arrow arum. Note the stems of ripening fruits curving downward toward the water. These fruits are an important duck food later in the season. August 3, 1923.



Fig. 113. Swamp loosestrife. An important plant in the marsh vegetation, forming shelter for many birds. August 3, 1923.



Fig. 114. The common rush. A characteristic plant of the marshes. August 7, 1923.

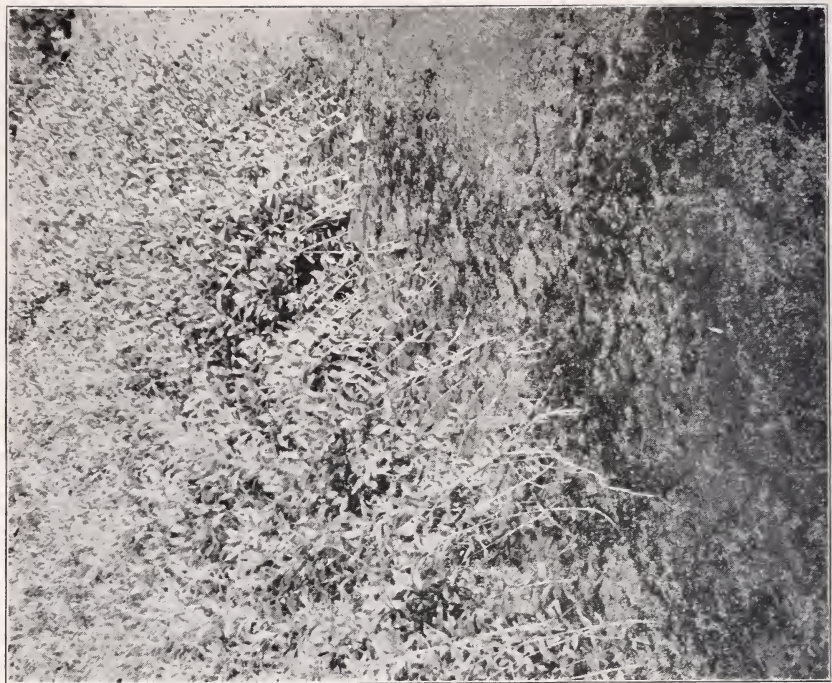


Fig. 115. Swamp loosestrife along the stream border. The overhanging branches of loosestrife form a favorite shelter for Ducks, Gallinules and Rails. Note the duckweed on the water surface. Black Creek, July 26, 1923.

Black Ducks were never observed to tip up, probably because of the shallow water, teal were seen to do a sort of semi-tip up, with head and shoulders under water, but the rest of the body out, and not at right angles to the surface, as in a true tip up. At Crusoe Lake the birds tipped up frequently.

Like the Black Duck this species bathed, preened and rested, particularly in the middle of the day. At one time on the edge of a small pool in Black Creek, in the heart of the Sink Hole Marsh, I observed the eight birds known to be there, all resting together. Some were in the water (Pl. 19, Fig. 12) and others were sitting on a log, each bird a foot or two from its neighbor. Some were sleeping with head under wing, and others were preening (Pl. 19, Fig. 11) or merely sitting quietly.

Wariness. This species was never so wary as the Black Duck, though I believe a little more so than the Wood Duck. More than once when all three species were in sight, a slight movement or noise on my part would start every Black Duck into assuming the alert position, but Teal and Wood Duck, though often much nearer me than the Black Duck, would go on feeding and not notice the noise or movement.

These birds seemed fond of the society of Black Ducks, and swam about near them, though keeping in a little company of their own apart from the Black Ducks. Like other species, they probably found far greater safety from danger when with the Black Ducks than when by themselves or with some less wary species.

In field identification of this species, there is one fact worth pointing out to safeguard the amateur from making mistakes. Ducks when swimming usually carry the wings drawn up above the water line, and supported by the feathers of the sides. That is, these feathers of the sides overlap the wings, and cover all but the tips and inner edges. For that reason neither the blue wing patch nor green speculum of this species shows commonly in a bird sitting on the water. Birds resting on land however droop the wings, and then marks show. These marks can be easily seen in birds that are stretching the wings or that are in flight. Under some conditions the green speculum was visible, but not the blue patch, and when that is the case it would seem to be easy to confuse this bird with a Green-winged Teal, a species that probably does not occur in these marshes in summer.

WOOD DUCK. *Aix sponsa* (Linnaeus)

Occurrence. It is a pleasure to report that in at least some of the marshes visited the Wood Duck (Pl. 6, Figs. 7, 8) is a common breed-

ing bird. It is by no means as numerous as the Black Duck, but is decidedly more numerous and more widely distributed than the Blue-winged Teal. It evidently breeds in greatest numbers in or near the Sink Hole Marsh where birds could always be found throughout the summer (Fig. 126). A few birds are to be found in the marshes between Otter Lake and Parker Pond, and a few along Muskrat Creek south of Parker Pond. On the Byron Mill Pond, Wood Ducks were seen regularly, the number seen at any one time varying from two to eleven. The greatest number of Black Ducks seen on this pond at one time was twenty-five, and perhaps the proportion of eleven to twenty-five would represent fairly well the relative abundance of these two species.

Habitat. For nesting the Wood Duck must have a tree or stump with an appropriate hollow. It is therefore not to be found in the nesting season in a marsh far from such trees. It prefers for feeding however, the pools and slow-moving streams of marshes. An area that is partly marsh and partly maple and elm swamp is ideal, providing both nesting and feeding grounds. They do not necessarily nest in swamps, however, but may do so on a wooded hillside that is not far from marsh or pond. Mr. E. G. Tabor of Meridian found such a nest years ago in a sugar maple on a hillside near Parker Pond.

For feeding grounds the Wood Duck, feeding mainly on the surface of the water, and apparently largely on insects, requires a place where the surface of the water is well-covered with water weeds. Not commonly tipping up, it does not require deeper water. The Sink Hole Marsh and the Byron Mill Pond, with their shallow water and water weeds, made ideal feeding grounds. Crusoe Lake, with its somewhat deeper water, was not often visited by Wood Ducks, though Black Ducks and Teal were common. Yet Wood Ducks were plentiful up Butler Creek a short distance from the Lake (Fig. 125).

Nesting and Young. Observations began so late in the season that no nests of the Wood Duck were located. Young birds were frequently seen, however. Most of these were birds already well grown, but early in July there were often half-grown birds still in the care of the parent, and on July 26 I observed an adult female in the Sink Hole Marsh with eight small downy young that could not have been many days old. These small young huddled close behind the parent as she swam across an open pool (Pl. 10, Fig. 3). Half-grown young keep together when without the parent, but as

they become well grown they become more independent of each other. Although they always like company of their own kind, they never seem so gregarious as Black Duck, Teal or Gallinules.

Feeding. The Wood Duck is a surface feeder, swimming about picking at the surface of the water (Pl. 10, Figs. 1, 2), and darting its head from one side to another. It evidently sees the food from some little distance, for it darts toward it suddenly. This action further leads one to believe that the food is largely insect, for the birds act as if it were alive and might escape if their actions were not quick. The food seems plentiful, for a bird will swim about for an hour or more on the surface of one small pool, going over the same spots again and again, and seeming always to find food enough to keep it busy. The water surface where they feed teems with insect life, small forms of Diptera, water striders, water beetles, and other forms the names of which are unfamiliar to me. While it is probable that the Wood Duck eats other forms of food, and feeds in another manner than that described, it was not seen to do so. Later in the season it is reported to eat fruits of the arrow arum and berries of the purple nightshade.

Voice. The Wood Duck's voice is rather high-pitched and whistle-like. The commonest note, given when disturbed and flying away from its feeding grounds, sounded like "weea weea weea," each note slightly slurred downward at the end. Sometimes it calls a slower, lower-pitched note, also slurred downward and with an "r"-like sound near the beginning, the note sounding like "waraow waraow waraow."

Flight. The flight of the Wood Duck is generally similar to that of other species (Pl. 10, Fig. 10), but is less swift than either the Black Duck or the Teal. Like other ducks they circle about spots where they wish to alight or from which they have been frightened, and then they set the wings and scale down to the water. Sometimes the wings make a whistling noise like that of the Black Duck, but usually the flight is silent where that of the Black Duck is nearly always accompanied by whistling.

Bathing, Preening and Resting. Like the other ducks, Wood Ducks indulge in bathing, preening and resting in the middle of the day when they have fed sufficiently. They usually climb out of the water to a stump or log, though they may bathe while sitting in the water. When resting or asleep, the breast feathers project out in front, and the head and bill rest on these feathers (Pl. 10, Figs. 8, 9), the head often turned a little to one side. At such times the

bird usually draws up one foot under the feathers and stands on but one. A front view of such a Wood Duck asleep shows that the supporting leg is not straight but slanting across in order to reach the proper place to support the center of gravity. Most of the longer-legged birds of the marsh have the legs habitually bent inwards, the joints between tibia and tarsus coming closest together, giving them a knock-kneed appearance. But the ducks, with shorter legs, have them bent the other way, and this is particularly true of the round-bodied Wood Duck, a bird perched on a stump, when resting on both feet, appearing to be decidedly bow-legged (Pl. 10, Fig. 5).

Wariness. The Wood Duck, when compared to the Black Duck, is far from wary. Birds seem reluctant to fly from a spot unless they are sure danger is imminent. They are much easier to approach and to photograph than Black Ducks. Slight imperfections in concealment of camera or photographer make little difference to them. On several occasions I have had them approach almost or quite into photographic range when I was entirely unconcealed, and then, so long as I made no sudden movement, they merely swam slowly away, not acting really frightened. I have never seen them assume the alert pose that the Black Duck uses when it is suspicious.

When swimming, this species, unlike other ducks, often keeps the head and neck moving backward and forward, a movement that is to be seen in the Gallinule and in swimming Rails, but that I do not remember to have seen in any other duck species. This movement may be partly due to the weedy condition of the water in the marshes, for it must be difficult swimming in water choked with bladderwort and other species of water weeds.

Relations to Other Species. The Wood Duck seems to like the company of other species about as well as its own kind. It associates with Black Ducks, Teal and Gallinules. It is quite common to see one or two Wood Ducks flying or swimming with a flock of Black Ducks. Probably they take advantage of the greater wariness of the Black Ducks and realize a greater freedom from danger when in their company.

Once in the Sink Hole Marsh two Wood Ducks flew over the place where I was studying, in partial concealment, the feeding habits of a Least Bittern. Not recognizing their species at once, I imitated the quack of a Black Duck. The birds flew by, and I turned my attention again to the Bittern. A moment later there was a whirl of wings, and a splash. One of the Wood Ducks had lighted in the water not fifteen feet from me. I reached for my camera

bulb, but not being concealed, the bird was up and away before I could grasp the bulb, or the other could alight. The latter whirled by a few feet above the water and then followed its frightened companion away. It certainly looked as if the Black Duck imitation had brought these birds down from their flight. I had tried this imitation on real Black Ducks many times with never more than partial success. One reason for success this time, with the Wood Duck, was probably the fact that I was concealed from above by the foliage of a swamp maple under which I was sitting.

At night Wood Ducks evidently take shelter among marsh vegetation, seeming more like the Gallinule in their love for such concealment than like the other ducks. At the Byron Mill Pond, Dr. Johnson and I watched a flock of eleven Wood Ducks one evening. They had taken shelter in the rushes on the north shore, and when we stopped near the point, they left and crossed the pond to the opposite shore. This leaving, however, was not sudden. One or two birds seemed suspicious of us, and led the rest away, the rear birds seeming reluctant to go, stopping and feeding or preening now and then, as they went out. Finally, however, they filed across the pond in a straight line, a method of swimming common to all the ducks in weedy situations.

Wood Ducks at this Byron Mill Pond, and at a small marsh near Clyde, were found hiding in vegetation in the daytime, the vegetation being cat-tails, rushes, or bur-reed. At the Mill Pond they were in the company of a number of Gallinules, and like them would come out and feed when there was no danger about, but would swim in among the rushes as soon as I appeared in sight, taking warning from the Gallinules, birds that were always more wary than the Wood Ducks.

Seasonal Movements. There is probably some late summer movement on the part of the Wood Duck as there is with other species. The Byron Mill Pond birds had probably not bred in the vicinity, but had come from some other locality, and the fact that the number of birds on the pond varied from day to day was indication that the birds were moving about at that season, August 8 to 14. There were decidedly less Wood Ducks in the Sink Hole Marsh in late August than there had been in late July and early August. On the other hand they did not gather at Crusoe Lake as did the Black Ducks, Mallards and Teal. A short distance above Crusoe Lake, however, I watched three birds on August 25, two swimming about together and a third, a drake, feeding and resting by itself. This bird I watched a long time, as it alternately fed and climbed to the

top of a stump to rest and sleep. Once a Green Heron lighted on one of its favorite resting places, and when the duck swam by within a few inches, the heron called a warning "cut cut cut cut," the duck remaining where it was. A little later the duck climbed to the top of another stump and sat there, only a few feet away from the heron, and not long after, when an adult Night Heron appeared among cat-tails just back of these birds, I had the pleasure of seeing three species in my glass at once, all entirely unaware of my close proximity.

Plumage Changes. This drake Wood Duck was beginning the post-nuptial moult, and showing the first beginnings of the brilliant plumage of fall and spring. All other drakes I had seen were in eclipse plumage. This bird showed the new plumage mainly about the head where the white lines were beginning to appear back of the eye, and the darker feathers to take on a greenish gloss. The black and white feathers along the sides had begun to appear, but the rest of the plumage was as it is in midsummer. In the eclipse plumage, the chief mark that distinguishes a drake seems to be the white line extending from the white of the throat up across the cheek (Pl. 6, Fig. 7). This mark appears to be always conspicuous throughout the summer.

BITTERN. *Botaurus lentiginosus* (Montagu)

The Bittern (Pl. 6, Fig. 2) was a common bird in all the marshes visited. It is perhaps not as numerous in some places as the Least Bittern, but except for that it exceeds in general abundance all herons except the Green Heron. This may be less true in late summer, however, when the numbers of Night and Great Blue Herons increase.

Habitat. The Bittern lives chiefly in the marshes, in and about the edges of pools, streams and ponds. While it is most commonly found among cat-tails or rushes, it is also quite frequently seen in the open away from their shelter. In nesting it is reported to select grassy meadows near marshes, but not themselves marshy in character. It feeds, however, in the marsh itself. In late summer it frequents mudholes in which there has been water earlier in the year, and in which there is evidently still to be found some kind of food.

Nesting and Young. No nests of the Bittern were found, it being evidently too late in the year to find nests easily. Young able to fly were seen as early as July 14, near Rector's, and half-grown young unable to fly were found in the Sink Hole Marsh July 22.



Fig. 116. Reed canary grass; a tall grass that forms small areas of marsh vegetation. July 18, 1923.



Fig. 117. The water surface from a point vertically above, showing covering of duckweed and bladderwort. Wood Ducks and Gallinules feed from the surface of such marsh waters. August 5, 1923.



Fig. 119. Swamp dock. The seeds of this plant are food for Ducks. July 30, 1923.



Fig. 118. Purple nightshade, with ripening berries; an important bird food, eaten by Wood Ducks, Gallinules and others. August

What may have been a nest of this species was found empty in late August. Whatever bird this nest belonged to, and a Bittern seemed most probable, it was unusual. The nest was situated on a bank along the tracks of the West Shore Railroad, and not ten feet from the rails. A small ditch with running water in it most of the summer was between it and the rails. The marsh was about 150 feet distant. From the size and situation of the nest, I could think of no bird so likely to have been its owner as the Bittern, yet even with this bird it seems unusual to think of its incubating within ten feet of a railroad track in constant use.

The half-grown young seen were in the company of the parent bird, and one at least was fed by it. The parent was first observed fishing near a blind where I had begun observations, along the edge of a cat-tail bordered stream. The first time that it caught something a young bird advanced from the shelter of the cat-tails and was fed, the parent stretching out its neck, and raising and half spreading its wings as it fed the young bird, whose pose at the time could not be clearly made out. After the feeding, the young bird sat beside the parent with its bill pointing downward toward the water in the same manner as the parent (Pl. 11, Fig. 2), apparently learning by imitation the first steps in the art of obtaining food. The process of feeding the young, at least two of which were concealed in the cat-tails nearby, was watched a number of times.

Feeding Habits. Bitterns catch a large part of their food by watching and waiting for it along the border of a stream or pool. All the herons have a generally similar habit of fishing, though it differs more or less in the different species. The Bittern sits motionless beside a pool, its bill pointing horizontally (Pl. 11, Fig. 1) and its eyes evidently looking down at the water. Then the bill turns slowly downward (Pl. 11, Fig. 3), and the neck which has been curled up so that the head rests against the shoulders, slowly straightens out farther and farther (Pl. 11, Fig. 4). Each change in position is so slow and deliberate that the bird always seems to be perfectly still, yet the change in posture is evidence that it actually is moving. Finally the bill is an inch or so from the water surface, the neck is out to nearly its full length. There is a sudden dart, and the neck is drawn quickly in with the prey held tight in the bill. There is a short pause, then the prey — fish, frog or insect — is turned about and swallowed head first with a single gulp.

Food. The only time that the character of the food thus obtained could be made out, it proved to be fish. At the Byron Mill Pond a bird fed frequently in a certain shallow spot along the shore where

frogs were abundant in the place whenever I passed that way, and I believe the frogs were the chief attraction there. The same bird, however, also fed nearer the upper end of the pond where it waded into the water (Pl. 11, Fig. 5), till it stood beside a narrow path of clearer, deeper water — the main path of the current through the pond — and fished from this position, where it definitely caught fish.

Perching. It has been stated somewhere that the Bittern never perches in a tree. While such a positive statement concerning the habits of a species is not safe to make, so far as my experience goes this is true. The bird usually rests on the ground or standing in shallow water. Sometimes it perches on a log or stump close to the water, and often it perches in cat-tails (Pl. 11, Fig. 7) at a point three or four feet above the water. When perched in this manner, its weight often breaks over the cat-tails at this point. Some mud-holes in the Sink Hole Marsh were more or less surrounded by cat-tails broken over in this manner (Figs. 131, 132, 133). Other herons may possibly have broken over the cat-tails in this manner, but the Least Bittern would be too light to do so, and so far as I observed it is not a common habit of the other herons to perch in cat-tails.

Walking. When on the ground, the Bittern commonly moves by a slow deliberate walk. It is fascinating to watch the bird as it slowly lifts its feet and spreads the toes wide to take a new hold on a cat-tail stalk ahead of it. When walking in the open and not looking for prey, the head is drawn in against the shoulders, but walking through cat-tails, or stalking in shallow water on the lookout for prey, the neck is more or less outstretched. Although the ordinary movement when undisturbed is slow and deliberate, the bird can move fast when necessary. If frightened in the open it generally flies, but when in cat-tails it runs away with head lowered (Pl. 11, Fig. 6) and body so close to the ground that the first time I saw this, I at first took the bird for a muskrat.

Protective Pose. The attitude of the Bittern best known to many bird students is the one with head and neck pointing vertically toward the sky (Pl. 11, Fig. 8), an attitude assumed when one approaches the bird closely. This attitude is supposed to be assumed for protective purposes, the striping of the head and neck imitating the lights and shadows of the cat-tails. While no one who has seen it will doubt that a bird standing in this attitude against a background of cat-tails is remarkably like its background and difficult to see because of this, yet there are a number of reasons

why I believe that concealment is not the real reason why the Bittern has this habit. First a large bird like the Bittern cannot have many enemies against whom such a habit would be useful. It could just as easily escape mammalian enemies by flying or running away as to stand still in this attitude. The attitude would, it seems to me, be useful only against hawks and men with firearms. Men with firearms cannot have been enemies long enough to have fixed the habit, and the number of hawks large enough to attack a Bittern is few. Further, the Bittern is admirably protectively colored by its back alone, without assuming this position, and the motion of assuming such a position would be more likely to attract a hawk's attention than to conceal the Bittern. The position from which the Bittern seems best concealed by this attitude is not the position from which it is likely to be seen by hawks.

These are negative reasons however. Argument that the habit is not protective is insufficient unless it gives some other explanation. Anyone who has been very close to a Bittern in this attitude must have noted the eyes, looking straight at the observer on either side of the bill. Undoubtedly the bird sees the observer with both, and possesses, when in this attitude, binocular vision. I believe, therefore, that the Bittern assumes this attitude merely to see better. Normally it wishes to see, when hunting food, that which is below it, and with the bill in a horizontal position this is easily done. But if a noise or movement attracts its attention ahead of it, up goes its head that it may look in that direction. This belief I found strengthened by observation of Bitterns from blinds, for they frequently assumed this attitude when there was nothing to frighten them in the least, but merely something to attract their attention. Thus a bird fishing on the border of a pool would suddenly take this attitude at the rattle of a Kingfisher, the splash of a muskrat, or the long call of a Gallinule or squeak of a Rail. Yet one bird that was fishing within a hundred and fifty feet of the New York Central Railroad tracks would not pay any attention to a train going by, though the weight of the train caused the whole foundation of the marsh to shake. Evidently the bird had become used to trains and was not interested in watching them.

There seems good reason to suppose that all the herons possess binocular vision, and see best that which is below the bill. That they can also see what is directly ahead of them is not to be doubted, but I believe that they see better when the bill is not in the way. If the true herons lived mainly on the ground instead of in trees, they too would have the habit of lifting the head like the

Bittern. If a man's nose were as long in proportion to his head as a Bittern's bill, he too would wish to point it skyward in order to see clearly that which was directly ahead of him.

Voice. Work in the marsh evidently began too late to hear or observe the pumping of the Bittern. The only sound the bird was heard to utter was a low pitched "gruh," often repeated two or three times, and used so far as my observation went, only when startled into sudden flight. At all other times the Bitterns observed were entirely silent. This sound is lower in pitch than the voice of the Great Blue Heron, and not nearly so loud as that of either the Great Blue or Night Herons.

Undulatory Motion. Once I observed the Bittern producing the curious undulatory motion of the lower neck that is a common habit in the Least Bittern. A description and discussion of this habit is to be found in the notes on the habits of that species.

LEAST BITTERN. *Ixobrychus exilis* (Gmelin)

Occurrence. The Least Bittern (Pl. 7, Fig. 4) is extremely common in most of the marshes visited. At the Byron Mill Pond, where the area of marsh is small, only one bird was seen. In other regions, at Otter Lake, Parker Pond, Crusoe Lake, the Sink Hole Marsh, and the Clyde Marsh, this species was frequently seen. It is difficult to get any sort of estimate of the relative abundance of marsh birds, but I should consider the Least Bittern third in abundance of the non-passerine marsh birds, being exceeded only by the Gallinule and the Virginia Rail. This is certainly true of the portions of marsh that are well watered with pools or streams, and about the edges of lakes, but in areas where there was little open water, and along the Barge Canal, where the cat-tail areas were nearly drained dry, this bird was not found, whereas the larger Bittern was about as abundant as in other places.

Nesting and Young. This bird evidently nests commonly. Three occupied nests were found early in July along Muskrat Creek, and numerous empty nests evidently belonging to this species were seen, both here and in other localities. Two nests were found just below the outlet of Parker Pond on July 6, each with four eggs. One was in cat-tails about four feet from the water (Fig. 128) and the other in a swamp loosestrife only about a foot from the water (Fig. 129). The third nest, with five partly grown young, most of them around, but not in the nest, was found in cat-tails further down Muskrat Creek on July 7. This nest was about 18 inches above the water (Fig. 127). All nests found, including the empty ones, were close to open water,—stream, pool, or lake. Evidently the birds do not nest far back into the marsh from such water.

No extended observations of the habits of adults about the nest were made. It was evident, however, that the male shares in nest duties, probably both in incubation and feeding young. The nest in loosestrife was found by seeing the male bird fly away from it as our boat approached. The nest with young was discovered by watching a male bird go to the nest several times with food.

The young in this nest were downy, the down being nearly white, but with a slight buffy tinge. These young were near the nest, but only one was in it. We caught, handled, and banded all of them. They were able to stand up and climb among the cat-tails, and to make vicious lunges at us with their bills when we approached them. One that I caught perched on my hand and lunged at my face over and over again, but, though free to do so, made no attempt to get away. The day we found them these birds, when perched and looking at us, kept the head and bill swaying back and forth. Two days later they were not observed to do this. The first day was windy and the second calm, and I suspect the motion was due to watching the swaying tops of the cat-tails (Barrows, '13). This motion was not like the undulatory motion of the adult bird described in a later paragraph. These young occasionally used their voices, producing a sound like a husky squeal.

Manners and Fishing Habits. The Least Bittern is one of the most interesting forms of bird life in the marsh. One never tires of watching them at their antics, particularly when they do not suspect the presence of the watcher. Having established oneself comfortably in a blind on the border of a stream, the work of observing this species is mainly a matter of patience, with a bit of luck thrown in. After waiting half an hour or so, nothing has happened save the passing of a noisy Kingfisher, or the occasional splash of a Barn Swallow catching insects on the water surface. The painted turtles that splashed into the water at our approach have again begun to climb out on the old log across the stream. A Gallinule comes out from its hiding and starts to feed. Then suddenly right across the stream we make out the shoulders and head of a Least Bittern poking through the cat-tails (Fig. 130a).

The bird walks slowly and deliberately (Pl. 12, Fig. 8), so slowly that ten seconds must elapse between the lifting of a foot and putting it down again. The bird approaches (Pl. 12, Fig. 7) a place where a clump of cat-tail has been overturned by the wind, and its stalks lying horizontally form a good perching place in reach of a small pool. It walks slowly out the length of a stalk, clasping the stalk with the toes turned in (Pl. 12, Fig. 6) and hind toes on the

outside. The front toes are widely spread. The head is drawn in against the shoulders and the bill is nearly horizontal (Pl. 12, Fig. 1), but the eyes are evidently watching the vegetation and water beneath it (Fig. 130b).

The bird reaches a fishing spot, and its lower neck begins to undulate rather slowly back and forth, as though in some suppressed excitement. Yet the catching of fish, on which errand it is bent, must be so common an occurrence that it is no longer exciting (Fig. 130c). Slowly and deliberately the neck of the bird uncurls and the bill moves outward and downward toward the water surface. The bird stretches out farther and farther (Pl. 12, Fig. 3) till its body and neck are in a straight line (Pl. 12, Fig. 4), the outline of the body from the base of the legs to a point at the tip of the bill tapering throughout its length, in almost perfectly straight lines. The bill almost touches the water. The bird stands in this position for a short time, then suddenly there is a dart of the head, and the neck is drawn up quickly, a small fish appearing in the tip of the bill. The fish is turned quickly about and swallowed head first.

When a fish has been captured at a pool the bird immediately turns about and stalks back into the cat-tails (Pl. 12, Fig. 5), rapidly this time. A few moments later, it appears at another spot farther up or downstream, stalks again very slowly out to its fishing place, again stretches the neck out, with the lower neck undulating; again assumes the posture in which the body is in a straight line, catches another fish, and moves on to another pool. This is the program over and over. When the bird has moved a certain distance downstream it retraces its steps back up the stream again, visiting the same fishing pools in reverse order. Although I have watched this fishing many times in different individuals, it always followed these general rules. Never did I see a bird stop at a pool after it had caught something once. Always the undulatory motion was observed when the bird approached the pool, and always the body straightened out just before the fish was caught. Dr. Johnson saw a bird at one point assume this straight-line pose when its body was perpendicular to the water surface, and it seemed that it would topple over from its perch. It did not do so however, but caught its fish and recovered its position easily.

The undulatory motion is peculiar and I can make no guess as to its purpose. The bill and head do not move in this motion, but only the front of the lower neck, a slow shaking from side to side. As noted above, I once saw the larger Bittern doing this same thing, so that the motion must be one common to the Bitterns.



Fig. 120. The area where Black Terns breed. Note the scarcity of cat-tails.
July 17, 1923.



Fig. 121. An empty nest, probably of the Black Tern, beneath an arrow arum.
July 17, 1923.



Fig. 122. Downy young of the Black Tern in various poses on their bed of cat-tails. July 17, 1923.

I have mentioned the food caught as fish. I am not sure, of course, that this was the food caught in every case, but in most cases where I had opportunity to see the object this is what it proved to be. The fish were small ones, brownish in color, and generally only a little over an inch in length. Once I saw a bird catch something in the vegetation that was either insect, spider, or other creature with long jointed legs.

Compared to the other herons in its fishing habits, this bird seems to be much more successful, catching something every few minutes, as frequently as it desires. Other herons I often watched for long periods of time before they caught anything. Further than this, the other herons all wait to catch something twice or more in the same place, while the Least Bittern does not do so twice in succession, though it returns later to the old fishing spot. This may account for its success, though the greater abundance of the smaller fish with which it is satisfied may be the chief reason.

Like the larger Bittern this bird sometimes assumes the attitude of head and neck erect (Pl. 12, Fig. 9) and bill pointing to the sky. One of the first birds of this species I ever saw, at a marsh near New Haven, Conn., in June, 1907, was standing above its nest in this attitude, facing me, with its yellow eyes staring on either side of its head. This species, however, does not assume this attitude as frequently as the larger Bittern. One could seldom watch a large Bittern for more than ten minutes without seeing it once or twice. But the Least Bittern was not often seen in this attitude, and I watched several birds for many hours, without seeing them assume it once.

Wariness. The Least Bittern is not particularly wary or difficult to approach or observe. A blind from which to observe this bird did not have to be constructed with great care, and in fact one bird from which I made many observations was studied entirely without one, the bird not heeding my presence so long as my motions were slow and I remained still the greater part of the time. Birds often allow a close approach, particularly when one is in a boat.

While the ordinary motion of a Least Bittern is slow and deliberate, and extremely slow when approaching a fishing place, yet the bird can move fast, even run when it desires. It is an expert at moving about through cat-tails and other similar vegetation, and its motions at such times are practically noiseless. It perches in cat-tails, on stumps, logs or bushes, and I once saw one in a tree, though this was not in the New York marshes, but in Connecticut. It sometimes rests on one foot only, as do many other marsh birds.

Voice. The voice of the Least Bittern seems to be little known. Silloway ('97, pp. 330-331) quotes a number of writers as stating that they have never heard it make a sound. Audubon, however, stated that a bird startled from the nest emits "a few notes resembling the syllable *qua*." Other authorities (e.g., Chapman, '00, p. 62) state that the bird makes a cooing noise. I listened all summer for a cooing noise from this bird. Once I heard what I thought might be it, but I could not trace the sound to its source and prove the authorship. This sound is probably produced earlier in the year. But that the Bittern produces another sound, not at all a "coo," and probably the same as Audubon's "*qua*," often repeated, I observed over and over again. The times that I actually saw the Bittern make the sound were comparatively few, but the times that I heard the sound, after knowing the bird that made it, were many. The call, as I should describe it, consists of four or five notes in quick succession, sounding like "ca-ca-ca-ca-ca." The notes are generally all on the same pitch. The voice is not exactly harsh, but cackling in sound; in fact, the call seems to me startlingly like the common call of the Magpie. Over and over, as I heard this sound from the depth of the marsh it gave me the impression of Montana willow thickets and Magpies; yet, not having heard the latter bird for eight years, the likeness may not be as great as I imagine. I think it possible that the fact that few observers record this sound from the Bittern may be because it is confused with the voice of the Gallinule. The latter bird is so variable in the sounds that it makes, that one is likely to attribute almost any sound to it. After I had seen my first Bittern make this cackling call, I did not feel quite sure, and hearing the sound from a distance would wonder whether I was really hearing the Least Bittern or a variation on the Gallinule. But after seeing the Bittern give its call several times, I became satisfied that I could distinguish it from Gallinule notes every time. The call is sometimes given when the bird is startled from a perch, and often when the bird is sitting in the marsh, when there seems to be no excuse for it other than the general desire, perhaps prompted by the calls of other species about it, to make some sort of noise.

Numbers and Mortality. The number of young Least Bitterns seen in the marsh in late July was large. These birds could be distinguished from parents by the natal down still adhering to some of the feathers of the head and back, even though the birds were apparently well grown. There was probably a high mortality among these young birds. We found two cases where such birds had perished; in one, a wing bone with a little flesh and one or two

primary feathers adhering to its end, seemed to indicate a bird destroyed by some natural enemy, perhaps a mink or weasel. The other was an unusual incident observed by Dr. Johnson. He noted two young Least Bitterns in the Clyde Marsh, and then near them a third bird caught in the stalks of a cat-tail. The bird was caught by one leg, the leg being between the stalks where they divide at the base, the large joint between tibia and tarsus holding the bird so that it could not pull its leg through, but with each struggle it sank deeper down into the fork and was held fast. The other two birds, evidently of the same brood, seemed indifferent to this bird's fate. It was impossible to reach the spot, as the way was across twenty feet of water and soft mud, and there was no boat or other means of getting to it. It was therefore necessary to leave the bird to its fate. This observation was on August 2. Returning to the spot August 14 the carcass of the unfortunate bird still hung from its clump of cat-tail. Probably such an accident is unusual. When one notes the great skill with which an adult Least Bittern moves through the cat-tails, it would seem impossible for such an accident to happen to any but a clumsy and unskilled young bird.

In the latter part of August, the numbers of this bird seemed to decrease. Perhaps the fall migration begins as early as this. In any event, where I had been seeing a dozen or more birds daily, I now began to see only one or two. Where this bird had been one of the most frequent visitors to the vicinity of my blinds, almost anywhere that I established them, it became scarce, sometimes a whole day going by without observing one near me. Yet they were by no means all gone, up to the last day of my stay, for my last afternoon (August 28) was spent largely in watching the antics and fishing habits of a Least Bittern.

GREAT BLUE HERON. *Ardea herodias herodias* (Linnaeus)

Occurrence. The Great Blue Heron (Pl. 6, Fig. 6) was common in all the marshes visited and at all places where it might be expected, except the Byron Mill Pond where a single bird was seen but once. It was quite common at Otter Lake, Parker Pond, and Crusoe Lake; and in the Sink Hole Marsh, particularly near Rector's at about the junction of Crusoe and Black Creeks. It was also noted near Clyde and along the Barge Canal.

Habitat. This bird frequents the edges of water everywhere, whether about ponds, streams, lakes or pools, but I did not note it about mud-holes after the water had dried up—favorite places for the Night Heron, Green Heron and Bittern. Although nesting

in trees, and often found where there are trees to use as perches, this bird may occur in open marshes a long distance from trees, resting on the ground, or on old logs and stumps that are present in some of the marshes to give evidence of trees that once grew there, though the trees themselves are long since gone.

Nesting. There are a number of reports of nesting colonies of this bird in the regions visited, but in spite of several efforts, none was located and observed. One colony was reported near Cross Lake, near Meridian, but a day's search of the region did not reveal its location. Not a single bird was seen anywhere about, so I believe the colony had moved elsewhere. Another colony was reported north of Parker Pond, but the actions of the birds there, and a regular line of flight from Otter Lake to Parker Pond, seemed to indicate that the colony was south of the pond, near the head of Muskrat Creek in an almost impassable maple swamp.

Another colony was reported southwest of Clyde along the Clyde River, and still another north of Crusoe Lake, but none of these was actually found. Young birds were seen regularly from late July on, the first being noted July 13 at Crusoe Lake.

Feeding. The Great Blue Herons feed much as do the other species, waiting for their prey usually standing in shallow water (Pl. 13, Fig. 2), lowering the neck and bill slowly toward the water (Pl. 13, Fig. 3), standing in this position quietly for a few moments, and then suddenly grasping the prey with a quick thrust of the bill. I actually watched the process less frequently with this species than with others. Much of my watching was in vain, for the birds did not seem to catch prey often. For example, I observed a bird on the shore of Crusoe Lake for nearly an hour. Several times it lowered its head as if it saw something interesting, but not once did it catch anything. This is in contrast to the Least Bittern, which seems able to catch something every three or four minutes. The larger bird should need a greater amount of food, but the greater size of the prey might make up for that to some extent. Yet the larger-sized prey should be less abundant, which is one reason why the birds would catch less than smaller species. It never seemed that the Great Blue Herons were nearly as successful fishermen as either one of the Bitterns. Perhaps the fishing was not so often observed because much of it was done at night.

Only once was the character of the food of this species observed. That once however was an interesting experience. Dr. Johnson and I were rowing along the Barge Canal, a few miles north of Montezuma, when we observed an immature Blue Heron ahead of us.

We stopped rowing and let the boat drift down toward the bird with the current. The bird had a fish, and closer observations showed it to be a bullhead about seven inches long (Pl. 13, Fig. 6). Over and over the bird attempted to swallow the fish head first, but with no success, owing to the sharp spine-like pectoral fins set out at right angles to the body. The fish appeared already dead. After fruitless attempts at swallowing, the bird would put it down on the ground and attack it with its bill. As we drifted nearer, the bird picked up its fish and stalked down the bank of the canal ahead of us. It finally flew out of sight with the fish in its bill. Perhaps it ultimately managed to pull the fish to pieces and thus dispose of it. Possibly an older bird would have known how to do this right away from former experience. The natural instinct, however, seems to be to swallow a fish whole, head first, and with only a few species, such as the bullhead, would such a method be unsuccessful.

Flight. In normal flight the Great Blue Heron has its legs outstretched back of it and neck curled up (Pl. 13, Fig. 7). Just before alighting, however, the legs are lowered, dangle beneath, and are thrown forward as it touches the ground. The neck at such times is partly uncurled and sometimes even straight out in front. I watched one bird fly a considerable distance across Crusoe Lake with neck stretched straight in front, (Pl. 13, Fig. 8) the entire time. Another bird at Parker Pond was seen soaring overhead in circles with the neck outstretched. It was calling the loud "groh" call. Every time I observed a bird in flight that was calling, the neck was outstretched or at least partly uncurled, and I have sometimes wondered if it is possible that the bird could not produce the call note with its head curled back against the shoulders.

A most peculiar and interesting flight performance of this species was observed one evening in the Sink Hole Marsh. It was nearly sundown the evening of July 26, and Dr. Johnson and I had remained in the marsh late to watch the evening activities of the wild life. We noted four Great Blue Herons flying across the marsh high overhead. They were in pairs, one pair a little in advance of the other. Suddenly the leader of the first pair swooped around and downward in a big circle, going back on its path and turning till directly under the second bird. Then it dropped almost perpendicularly down a distance of fifty or sixty feet and then proceeded on its way with neck outstretched and calling "groh, groh, groh." It drew the neck slowly back to the normal flight position, going

through many grotesque curves before doing so. The second bird followed the first, going through exactly the same motions and actions, till it ended back of and a little below the first. Then the second pair reached about the same spot, and they too, one after the other, went through the same performance, as though playing "follow the leader."

At this season of the year courtship must surely be over, otherwise I would have thought this performance was such. Possibly the birds were young ones in first flight. Perhaps they were adult birds that were merely going through some sort of play, such as the play performances of the Black Duck.

Alighting and Walking. When alighting in a tree this bird always seems to find difficulty in getting its balance. Once two birds flew near my blind and one alighted in a small maple very near me. The other flew near and attempted to alight in the same tree, though its top was hardly big enough for one such bird. The first bird twisted its neck about so that the bill pointed directly up toward the second, in a threatening attitude (Pl. 13, Figs. 4, 5). The second bird changed its course and flew to a small elm, alighted there, and after a few moments of flapping and attempting to get their equilibrium the two birds became quiet.

It is always interesting to watch a Great Blue Heron walking. It lifts the feet straight up and rather high, folding the toes as it does so, then moves them slowly forward and downward, spreading the toes again as it sets them down. The performance is a slow, dignified stalk.

Other Habits. One bird that alighted in a tall tree near me stood a long time with the neck stretched vertically. It looked about in first one direction and then another, with bill open as though panting in the heat, for it was uncomfortably warm that day. The open bill made the bird appear to be always laughing, particularly when it faced directly toward me. After a time it slowly curved the neck down to the s-shaped curve habitual with this species in its normal resting pose (Pl. 13, Fig. 1).

This same bird kept up a side to side shaking of the cheeks and throat almost continually. This motion may have had some relation to the undulatory motions of the Bitterns, but it was faster, a trembling vibration, where that of the Bittern was a slow undulation. Then too the motion was entirely in the cheeks and not in the lower neck as in the Bitterns.

Voice. The voice of the Great Blue Heron is rather harsh and low pitched. It is not so low, however, as that of the Night Heron.



Fig. 123. A Black Duck amid the cat-tails on Crusoe Lake. August 17, 1923.



Fig. 124. Black Ducks on Crusoe Lake. Cat-tail marsh in background. August 24, 1923.



Fig. 125. Wood Ducks and an immature Night Heron, on Butler Creek above Crusoe Lake. The Heron stands at the water's edge just back of the rear Duck. August 25, 1923.



Fig. 126. A Wood Duck in the Sink Hole Marsh. August 3, 1923.

A single note sounds like "grah" or "groh." A number of these notes falling in pitch, and with rather slight pauses between them are often given, particularly as the bird takes flight. "Grah grah grah groh groh" would be an interpretation of this performance. Other notes less commonly used are longer and slurred downward, sounding like "grayaaah." Others I have written in my note book as "kyak kyak krah krah kroh." A startled bird usually gives but a single call, and often flies away silently.

Vision and Hearing. I believe the Great Blue Heron, like the Bittern, possesses binocular vision. My evidence on this point came as a surprise. I was working in the vicinity of Rector's, and had my camera set up and trained on the branches of a willow that leaned over Black Creek and showed evidence of being in frequent use as a perching place for herons. After a long fruitless wait with the sun growing hotter, I decided that I could work the camera with a thread from the shade of the willow, and be just as well concealed from the birds. So I left the camera and proceeded to look over the situation. I had stepped out on the trunk of the willow where it crossed the stream when I heard the notes of a Great Blue Heron and crouched down as nearly out of sight as possible. The bird flew upstream and lighted in the branches of the willow about eight feet over my head. It had evidently not seen me or had taken me for a part of the tree. After a little it discovered me, but as I made no movement, it did not fly but stood in the tree looking down at me with both eyes. The bill was not pointed toward me but was horizontal, but I could see the two eyes on either side of the bill glaring at me just as they do with the Bittern when its head is lifted. It was this occurrence that first started me thinking of the subject of vision in herons, and that led me to the belief that the Bittern's habit of standing with bill pointing straight up was merely to see better.

Although this heron is generally considered a wary and suspicious bird, my experience this summer did not seem to prove this particularly. While the bird is difficult to approach in the open, and ready to fly quickly at danger, it does not impress me as particularly wary of danger. It is not especially suspicious of blinds. Not only did I experience the above instance when a bird came within eight feet of me and remained for several minutes, but there were other instances. Once in a marsh near Otter Lake a bird lighted suddenly within thirty feet of Dr. Johnson and myself. We were not concealed, but were walking in the open. The bird quickly discovered its mistake as we attempted to get out cameras.

This was in a pasture beside the marsh, and I suppose the bird had not looked at us carefully and had supposed we were one or more of the grazing cattle.

That the bird has a quick ear to catch suspicious sounds is evident, for when one alighted thirty feet directly in front of my blind (Fig. 135), it heard the slight click of the shutter plainly, and flew off with a surprised "groh." This was in great contrast to two Wood Ducks that appeared at the same spot a little later, and that allowed me not only to click the shutter but to turn the film pack without being disturbed.

Seasonal Movement. In late July I believe that this species increased in the Sink Hole Marsh and some other areas not near its breeding localities. This would be natural with the northward movement that takes place with herons at this season of the year. Later, in late August, it decreased again, though it was never entirely gone. Probably this was due to a further northward movement, and a scarcity of breeding grounds to the south to supply more birds from that direction.

GREEN HERON. *Butorides virescens virescens* (Linnaeus)

Occurrence. The Green Heron (Pl. 6, Fig. 5) is the commonest of the true herons in the marshes visited, and in some localities where bushes and trees are found is more abundant than either of the Bitterns, but in the true cat-tail marshes, away from trees, the Bitterns are more abundant.

Habitat. The Green Heron, in the nesting season, is found mainly where there are bushes or trees for nesting sites, and yet marsh areas near where it can feed. About the edges of the ponds and lakes it was common, as there were trees near in all cases. In the northern part of the Sink Hole Marsh it was also common, as here there was a mixture of marsh and swamp thicket. For feeding grounds this bird prefers the border of streams or pools, or in late summer, mud-holes where there are logs, stumps or low branches near the water on which it can perch to fish. I did not see it fish from the ground or wading in the water as I did other herons.

Nesting. This bird undoubtedly nests abundantly in this region in bushes or trees in or near marshes. We found two nests, one at Otter Lake July 4, containing eggs (Fig. 134), and one near the Clyde Marsh August 2, containing small young. The first nest was in a leaning willow, over the water of a marsh, and the second in a medium-sized red maple, and between fifteen and twenty feet from the ground. The young had left the latter nest by August 14 and were in the trees near by and able to fly a little.

Feeding. The Green Heron fishes as do the other herons. Its methods suggest those of the Least Bittern, though it always seems to fish from log, limb, or stump. It walks deliberately and slowly out along a limb overhanging a pool (Pl. 14, Fig. 4), and perches there with bill pointed down toward the water (Pl. 14, Figs. 5, 6). Sometimes the neck is stretched nearly to its full length, but it never quite straightens out into the remarkable straight line assumed so frequently by the Least Bittern. The bird seems nearly as successful in its fishing as the Least Bittern, catching and swallowing something every few minutes. It does not however always change its position for a new one after capturing something, but makes two or three catches from the same point. Neither does it fish at numerous points along the water's edge in a certain locality, but from only one or two, flying to some more distant locality when it tires of these. What is probably the same bird will return however to the same fishing log or stump over and over, and may be seen there several days in succession.

At one locality a bird was seen to frequent the end of a certain log as a fishing place, and the individual was recognizable because it was an adult in unusually brilliant plumage. Its head and neck were not the ordinary chestnut color, but a deep rich maroon that was almost purple. One day while watching from a blind near this bird's fishing log, a Green Heron in immature plumage flew down and lighted on the end of the log to start fishing. The bright-plumaged bird had been there a short time before but I supposed it had left the vicinity. As soon as this younger bird arrived, however, it too appeared and drove the intruder away. Then it stood on the end of the log awhile as if going to fish, but soon retired again to the bank.

Resting. When not fishing this bird normally rests in a tree where it can keep a lookout up and down stream. It will sit practically motionless for a long time (Pl. 14, Fig. 1). A number of times birds of this species perched so near my blinds that they were a source of trouble. I wished to study certain other species, but did not care to betray my presence by alarming the Heron, whose close proximity was such that I must be extremely cautious in making a slight movement. Normally a Green Heron resting in a tree perches in the ordinary manner, but I noted one bird perched so that the tarsus of one leg rested lengthwise on a limb. At other times they perched for quite a while with the legs straddled apart on two widely divergent branches (Pl. 14, Fig. 2).

I have mentioned the undulatory movement of the lower necks of the Bitterns and a shaking motion in the cheeks of the Great Blue Heron. The particular motion that this species indulges in is a rapid twitching of the tail. It seems rather curious that herons should have these motions that have no apparent purpose; yet all of them, except the cheek motion of the Great Blue Heron, were witnessed a number of times in different individuals.

Adaptation. When one compares the habits of the Herons with the Bitterns, it would seem that the Herons have the advantage. They can do practically everything the Bitterns can do and many more things beside. They do not have habits of running rapidly on the ground or of hiding in vegetation or stalking through cat-tail growths, but with their superior powers of sustained flight these are unnecessary. The Green Heron, as compared to the Least Bittern for example, is much more widely adapted to varied conditions. Its nesting site is not limited. Its feeding places may be both in the marshes and in more open situations, where the Bittern is limited to the vicinity of protecting vegetation. It is about as expert a fisherman as the Least Bittern. If the day comes that all our marsh areas are drained, the Least Bittern will be one of the first species to become extinct, but the Green Heron will be able to adapt itself to new conditions and will persist.

Voice. The commonest call of the Green Heron when startled is a loud explosive "kee-oh!" slurred downward on the end. This is often varied however to a less squeaky and harsher sound "skaow!" and all gradations from one sound to the other may be heard, showing that these two calls are related. It also varies at times so as to have an l-like sound in it: "kuleeoh." Two birds that I observed fighting gave this same sort of call in a long-drawn-out form: "skee-ee-a-a-a-ow." Another call is a series of short, lower notes: "cut-cut-cut-cut-cut-cut-cut," or varied to "ca-ca-ca-ca-ca-ca-ca." This call is given after a bird has been somewhat startled and is nervous or suspicious. For example, one day a Green Heron alighted within a few feet of my blind with its back to me, fishing from a stump. After some time a muskrat left the water and crawled up over the same stump. The Heron was startled and called a loud "skaow!" then flew up to a small tree and sat there calling "cut-cut-cut-cut-cut" over and over. The appearance of a muskrat often seems to have this same effect on many of the marsh birds. Probably this is because this animal is not immediately distinguishable from a mink or weasel or other species that would do the bird harm. On another occasion a heron I had been watching suddenly called "cut-

cut-cut," and presently I observed a Wood Duck swimming past its stump only a few inches away. The bird whose photographs are here reproduced in Figs. 131, 132, 133, being about fifteen feet from me and the camera, evidently heard the click of the shutter and the movement of turning my films, for it began an anxious "cut-cut" after the first picture was taken. It evidently did not see movement through the thick screen of cat-tails back of which I was hidden, so that it was not enough alarmed to fly away till I had taken three pictures. In fact, I might have taken many more, but waited to catch the bird in different poses.

Fighting. Aside from the instance mentioned above, where an adult bird drove an immature one from its fishing log, I one day observed a fight between two immature birds. One bird would fly toward the other as it sat perched in a tree. The perching bird would point its bill toward its antagonist and lunge at it as it came within reach. Then both birds would lunge at each other with their bills, flapping their wings to hold their balance, with the green feathers on the crown of the head erect. Finally one bird would fly away and attempt to be at peace for a time, but the other bird would follow and attack it again. This was kept up as long as I cared to watch. It was late in the season, Aug. 26, so that such a fight as this could hardly be either because of mates or territory. Neither bird injured the other or actually struck it with its bill, yet the manner in which they lunged viciously at each other made them appear to be in earnest about the fight.

While this species of heron is supposedly much tamer than the larger species, I did not find this to be true. The Green Heron appeared fully as wary of danger as any other. While the number of times that birds came near my blind was greater than in the case of the Great Blue Heron, this is explained by the greater abundance of the bird. I found it just as difficult to conceal myself from it, and the bird just as quick to hear a slight sound and fly away as other species.

I have noted above the habit of erecting the feathers on the top of the head during a fight. This habit is also indulged on many other occasions; sometimes when sitting in a tree (Pl. 14, Fig. 3), and there seems to be no reason at all, the bird suddenly straightens out the neck and erects the head feathers. Often in flight these feathers are erected, and nearly always just as the bird is about to alight.

BLACK-CROWNED NIGHT HERON. *Nycticorax nycticorax naevius* (Boddaert)

Occurrence. In the early part of the summer, this species (Pl. 6, Figs. 3, 4) was the least numerous of the five herons found in the marshes. The few birds seen, at Otter Lake, Parker Pond, Crusoe Lake, Rector's, and on the Barge Canal, were all in immature plumage, and were probably young of the previous year and not breeding. There was no evidence of the breeding of this species anywhere in the near vicinity of the areas visited. The first bird in adult plumage was seen in the Sink Hole Marsh July 22, and after that date the species, both young and adult, became more numerous, until by late August it was extremely common.

Habitat. The Night Heron was found mainly in those marshes where trees were near. I do not remember to have seen it at all in the treeless portions of the marshes. It frequented stream borders and mud-holes. In late August it was particularly abundant in that portion of the Sink Hole Marsh lying north of the Rochester and Syracuse trolley line. This portion of the marsh is interspersed everywhere with mud-holes, and though trees are scattered and few, there are numerous old logs in and about the mud-holes that are evidence of trees that once grew in the region, and convenient perches for herons.

Feeding. Owing to the usually nocturnal habits of this bird, it was observed fishing only once. Then the bird, which was in full adult plumage, fished by standing in the water among cat-tails on the border of a slow-moving stream (Pl. 14, Fig. 10). The bird held its body in a horizontal position. The neck was drawn in and the bill pointed somewhat downward (Pl. 14, Fig. 12). No awkward, grotesque curve to the neck was visible as in the Great Blue Heron, nor was the neck slowly straightened out as in the Bitterns and the Green Heron. The bird simply stood still until ready to strike, then the neck was out and in like a flash (Pl. 14, Fig. 11), and the prey swallowed with a gulp before I could make out its character.

This species is most commonly seen sitting at rest in the trees (Pl. 14, Figs. 7, 8) or flying about singly or in small companies. It is the most gregarious of the herons and is seldom found singly. The Bitterns are always solitary of habit except the young of a brood not long out of the nest. The Green Heron is rather inclined to solitary habits also. The Great Blue Heron is frequently alone, though more often found in pairs. But Night Herons are usually in company, two to a dozen or so being together, and fishing in the near vicinity of one another.



Fig. 127. Young Least Bitterns in the nest. July 9, 1923.



Fig. 128. Nest and eggs of a Least Bittern in cat-tails. July 6, 1923.



Fig. 129. Nest and eggs of a Least Bittern in swamp loosestrife. July 6, 1923.

The Night Heron flies with a slow, flapping motion, the neck curled up so that the top of the head and the line of the back form a straight line with no perceptible break (Pl. 14, Fig. 9). When about to alight it often sets the wings and floats or soars down. The Great Blue Heron can do this, but it does not seem to be habitual with it as with the Night Heron. Night Herons also alight with less flapping than either Great Blue or Green Herons. They seem to get their balance in the treetops easily and are never so awkward and clumsy as are Great Blues.

Night Herons often perch on the ground near the edge of water even though they have no apparent intention of fishing. Sometimes they sit thus with neck curled in the normal attitude (Fig. 125) and sometimes with the neck stretched straight up to the fullest length.

Voice. The common call of this heron is usually written "qwawk." Frequently, however, the bird varies it to "quoh." This call is given when flying overhead and sometimes when startled. A combination of eight to a dozen or more notes something like this are uttered as the bird flies in to a new fishing or resting spot. These calls begin on a rather higher pitch and end on a lower. Sometimes the last part of such a call is composed of notes grouped in twos or threes with pauses between them. Thus I wrote the utterance of one bird as "qwawk- -awk-awk- - -awk-uk- - -kuk-uk-uk- - -kuk-uk-uk- - -kuk-uk-uk."

Plumage. In early summer all birds seen were in immature plumage. Later in the summer, birds of the year in heavily streaked plumage were most abundant. Adults were also seen, some bearing one or two nuptial plumes, although this is the season, if any, when they should be without them. A number of birds were in a plumage like the adult except that the throat and breast were not pure white but strongly pinkish buff, and they were without nuptial plumes.

VIRGINIA RAIL. *Rallus virginianus* (Linnaeus)

Occurrence. The Virginia Rail (Pl. 7, Figs. 7, 8), is the most abundant rail in this region. It was found in all marshes visited and was usually in greater numbers than the Sora. About the Byron Mill Pond the Sora was evidently more abundant, the Virginia Rail not being observed about the edge of the pond itself, but found a short distance away in marshy areas west of the pond. In the marshes along Muskrat Creek, in the Sink Hole Marsh and about Crusoe Lake, this Rail was more abundant and always more in evidence than the Sora.

Habitat. This bird lives entirely in the true marsh areas, running through cat-tails, grasses, under loosestrifes and other marsh plants, and occasionally venturing into the open about a mud-hole or pool, or along the border of a stream (Figs. 137-139). It likes the vicinity of pools, mud-holes and muskrat runways, where it finds abundant soft mud for feeding grounds. It seems to remain back in the marshes to a greater extent than the Sora, and is less likely to be seen than that bird about the edges of larger bodies of water.

Nesting. No nests of this species with eggs were found. Downy young and half-grown young, and full-grown birds in immature plumage, were common. In late summer immature birds were more abundant than adults. Downy young were first seen in a marsh south of Otter Lake on July 7. The last in that stage were noted near Byron on August 13. Near the latter young was an empty nest probably belonging to this species. It was built in the base of a clump of rushes (*Juncus effusus*) and was constructed largely of the stalks of that plant. Other empty nests found may have belonged to this species.

Feeding and Other Behavior. This bird remains the greater part of the time hidden in cat-tails or other marsh vegetation. It may best be observed by patient waiting about the borders of pools or mud-holes where it feeds. It is abundant enough so that one or more birds are fairly certain to make their appearance in due time. I cannot remember a single blind that I built and worked from for any length of time, where this species did not appear sooner or later, and there is perhaps no other species of which this is true save the Gallinule. The birds keep near the sheltering vegetation, never venturing far into the open. If frightened, they hurry back into this shelter, but they are not so easily frightened as is the Sora.

When feeding, they walk over the surface of soft mud (Pl. 15, Fig. 3) or along the edge of a marshy stream, probing with the bill into the mud or water for food (Pl. 15, Fig. 5). They thrust the bill into the mud or water for nearly its full length (Pl. 15, Fig. 4), move it up and down rapidly three or four times, then withdraw it and thrust it in again at another point. What food they obtain by this method could not be made out, nor was it certain that they obtained food at every thrust. While this was the commonest method of feeding, I sometimes saw them obtain food in a different manner. At one mud-hole I noted an insect about a quarter of an inch in diameter lying in the mud and kicking, but unable to move. It seemed to be a round beetle, but it was so covered with mud that

I could not make out its identity certainly. An immature Virginia Rail that I had been watching passed it several times, paying no attention to it, but continued feeding by probing. A little later an adult Virginia Rail appeared, fed over the same territory, and picked up and swallowed the insect quickly. On another day an immature bird feeding under the shelter of a loosestrife, picked several insects from its foliage overhead (Pl. 15, Fig. 7).

When running or walking in the open, Virginia Rails carry the tail turned up almost at right angles to the back (Pl. 15, Figs. 1, 6). When under shelter of vegetation, however, the tail is turned down and is less conspicuous. The birds run over the mud with ease in most places, but I watched one wade through mud so soft that it sank in almost to the feathers, and had to progress slowly and lift its feet high.

One immature bird observed had a lame foot which it dragged about. The toes of this foot were drawn up and never spread, and the joint between tibia and tarsus was always bent, the attitude suggesting that the leg was paralyzed. This bird fed without inconvenience, hopping about on one foot. It evidently tired easily, however, for several times in the course of an hour or two it sat down to rest (Pl. 15, Fig. 9) for several minutes at a time. It always did this in the same spot, feeding up and down the stream border near it and returning to the spot whenever it wished to rest.

The flight of this Rail always appears heavy and labored. In the short flights it sometimes takes in the marshes, the legs always dangle beneath the bird. This is probably not the case in the more extended flights on migration. The flight in the marshes is most commonly taken when the bird wishes to cross a stream where the water is too deep and free from water weeds to allow the bird to wade. In several cases where water weeds were thick, I watched birds cross the stream walking on the plants.

In one case I saw a bird of this species take flight when it seemed entirely unnecessary, and was contrary to its usual procedure. An adult was feeding near one end of a mud-hole and an immature bird near the other. The immature bird suddenly saw the adult and ran toward it, and the adult, seeing it coming, rose in flight over the cattails and dropped out of sight, evidently near another neighboring mud-hole. This was the second time that I had seen an adult Virginia Rail avoid a full-grown bird in immature plumage. I do not think that the immature bird was attempting to drive the other from its feeding ground, but that the adult in each case was the parent,

and that the immature bird, not having wholly forgotten parental care, ran to it as soon as it saw it, the parent avoiding the young bird because it was now able to shift for itself.

Usually the Virginia Rail is solitary in its feeding habits in late summer, but sometimes two immature birds may be seen together, or an adult and an immature. I never happened to see two adults in the field at once. I never noted any hostility toward each other on the part of these birds unless the incident quoted above was such.

Voice. It seems probable that some of the calls of this species are given only in spring or early summer, for I heard no calls such as the "Cut-cut, cutta cutta" that has been described by Mr. Brewster and others. The calls heard most frequently during the summer were delivered in a high-pitched, squeaky voice. The commonest call of this sort consisted of two short notes, the second lower in pitch than the first, the two together sounding like "keekek." Occasionally there was a single note "keek" and sometimes a longer slurred note "keeyah"; and sometimes a series of these notes was run together in a longer call something as follows: "Keek- - -keek- - -keek- - -keek- -keek- -kek-ekekekekek- -kek- -keek." These notes were often indulged when the bird was disturbed by my approach to its haunt, and I believe they serve as a danger call to the young. But they were also sometimes used when there seemed to be nothing at all to provoke them. Once I observed a bird calling as it fed, probing in the mud between calls. The long, slightly curved bill opened with every call, but the bird was so intent on feeding that it did not lift its head to call. I heard one or two other calls of an entirely different nature that I had some reason to think were produced by Virginia Rails, but the authorship was not proved.

Wariness. This bird is not particularly wary. It will not remain in the open when one approaches, but runs to the shelter of marsh vegetation. But it emerges again quickly as soon as one is quiet. It is much less wary than the Sora, may be observed easily without a blind, and photographed with little difficulty without attempt to conceal the camera or the photographer (Fig. 139). It is on the whole the most easily observed and photographed bird in the marshes, that is, when one uses the method of waiting for birds to come to him. The observer who pushes through the marsh to try to find what is in it will not see this species often. A number of times birds came very near my blind. Once an immature bird stood within a foot of my hand. At Crusoe Lake an adult came within the circle of cat-tail stalks that constituted my blind and fed close to my foot.



Fig. 130. A Least Bittern in its haunts in the cat-tail marsh. (a) Emerging from the cat-tails; (b) looking about; (c) beginning to fish; (d) intent on fishing. August 28, 1923.

On another occasion a bird fed on the other side of a big maple tree root a few feet from me, but where I could not see it and would not have known of its presence save for its reflection that could be seen in a pool under the root.

Relation to Other Species. Once I observed an adult Rail that had been feeding on the edge of a stream retire out of sight in the cat-tails. A few moments later a Song Sparrow alighted where it had been feeding. The Rail appeared immediately and charged at the Sparrow, calling "keekek- keekek- -ek-ek-ek-ekekek." The Sparrow withdrew in a hurry, seeming much frightened. In my experience the Song Sparrow as a species is the most belligerent of all the sparrows, driving from a food supply not only the supposedly quarrelsome English Sparrow, and the meeker Tree Sparrow, but even such a large species as the Fox Sparrow. This bird however showed no desire to stay and face the Rail. Perhaps it was an individual not so strongly belligerent as most of its species. However the bird had alighted in the spot by accident. There was no special food supply there that would attract it.

A relationship between rails in general and this species in particular and the muskrat, is noticeable. The runways the muskrat constructs through the marsh vegetation form pathways through which rails may move about easily and in which they may feed. They are often met in such runways or seen following their courses through the marsh. When they appear on the stream border, it is most often at the entrance to one of these runways. Thus the muskrat creates better conditions in the marsh for the life of the rail.

One day I watched a rail feeding in the vicinity of a water snake. It fed close to the snake a number of times, paying no attention to it. The snake was curled up in a warm spot in the sun, and was indifferent to the presence of the rail. So far as observations I made count, the water snake does not prey upon the bird life of the marsh, and the birds of the marsh show no fear of it.

Plumage. In late summer the plumage of immature Virginia Rails is interesting, varying greatly in individuals. This may be partly due to age, the birds of earlier broods being more advanced than the later ones. In general, the immature bird is black on the head, neck and breast, and brown and black streaked on the back. The throat is more or less white, and a superciliary line varies from grayish or brownish, through buff, to nearly pure white. Many birds have a white line extending from the throat down the middle of the breast, but others are entirely without this. The richer adult

colors seem to begin to come in young birds in late summer, and I was not always sure that birds I took for adults were not young that had passed the post-juvenal moult. The adult colorings appear first in the wing coverts and also in the white barrings of the flanks and under parts. Some birds show a breast of mixed black and rufous.

The color of feet, eye and bill are also of interest. In the adult these are all dark, rather dull red. The eye of an immature bird appears, so far as close field observation can determine, to be black. The bill is mainly black with more or less yellowish at the base of the lower mandible. The legs are dull yellow, or grayish tinged with yellow. Examination of dried skins seems to show that these colors fade more quickly in immature birds than in adults, so that the color of these parts of immature birds, when obtained from skins, is not reliable.

SORA. *Porzana carolina* (Linnaeus)

Occurrence. The Sora (Pl. 7, Fig. 6) is fairly common in the marshes, though in most places not so numerous as the Virginia Rail. At the Byron Mill Pond it was seen in greater numbers, but in all other localities one would encounter two or three Virginia Rails to one Sora.

Habitat. The Sora lives in marsh areas among cat-tails, rushes or other marsh vegetation. It is found mainly near water where there are streams or pools with marshy borders. The greater abundance at the Byron Mill Pond may have been due to the more extensive areas of rushes (*Juncus effusus*) there. In late summer, when the pools of the marshes dried up to mud-holes, the Soras all seemed to retire to the stream border where water was still found, a contrast to the Virginia Rail that was equally abundant about either mud-holes or pools of water. This difference is probably due to the fact that the Virginia Rail probes for its food and the Sora does not.

Nesting. Nests of this species, or small young, were not found. Young of the year were common, but they seemed to be already full grown, even early in July. The nesting of this species must be over earlier in the season than most other marsh birds. Perhaps the Sora has but a single brood where most of the other birds of the marsh have two.

Feeding. The Sora feeds mainly in mud, weeds, and about the edges of water. It evidently catches some insects feeding in this manner, for I have seen it run rapidly toward something, and

pick it up in a hurry as if it were alive and might escape. I could never make out definitely the character of the food it ate. I never saw it probe, as does the Virginia Rail, and I suspect that the food contains a larger percentage of seeds or other vegetable substances than that of the Virginia Rail.

Wariness. While both the Sora and the Virginia Rail run over the soft ground with tails up and heads down to feed (Pl. 15, Fig. 12), yet there is considerable contrast in their habits. The Sora is much more timid about venturing into the open. It is always ready at a moment's notice to run back into shelter, and once it is frightened back, a long patient wait is necessary before it will reappear. Walking in the open (Pl. 15, Fig. 10) it remains constantly on the alert, turning its head from side to side to watch for danger. A slight movement of the observer, if imperfectly concealed by his blind, a startled "chack" of the Red-wing, a splash as a painted turtle leaves the log where it was sunning, all these are sure to start the Sora on a rapid run to shelter. I well remember the great fright of the only bird successfully photographed (Fig. 136) when the camera shutter clicked.

Swimming. While the Sora is most commonly seen walking or running on the shore, it sometimes wades in shallow water, and rarely swims, a thing I did not see the Virginia Rail do. Once it swam about on the surface of a pool (Pl. 15, Fig. 13) like a Gallinule, its head and neck jerking back and forth, and its tail up at right angles to its back. On this occasion, it picked at the water surface much as do both the Wood Duck and the Gallinule. At other times its swimming was chiefly from a desire to cross a stream, swimming evidently being easier for the bird than flying.

Flying. I neither have record in my notes, nor any remembrance of having seen this species fly at any time during the summer. In other localities I have often flushed it from short marsh grass and seen it in flight, but from experiences of this summer I should say that it is much less likely to fly of its own accord than the Virginia Rail. On July 20 I picked up a dead adult Sora along the railroad tracks where they cross the Sink Hole Marsh. The bird had probably killed itself by flying into wires.

Other Habits. Like the Virginia Rail, this bird is fond of muskrat runways, and lives largely along their borders and entrances. Like the Virginia Rail and in contrast to the Gallinule, it is solitary in its habits, as a rule only one bird being seen at a time. At the Byron Mill Pond, I often saw several at once, but they were not near each other, but considerable distances apart.

Voice. Through the early part of the summer, the Sora was silent most of the time, or if it called, the call was one that I did not recognize. I frequently heard calls from the marsh that I could not recognize. The call of the Sora described as "kerwee" was not heard, but twice I heard a call that sounded like "ker-waaow" in a voice like that of the catbird. I traced this sound definitely to the Sora, but these were the only times I heard any such call. The other call that I heard from the Sora was the one that has been called a whinny. I heard this once on July 5 in the marsh between Otter Lake and Parker Pond, once near Savannah on July 16, and frequently in the marshes from August 14 to the end of the month. This call consists of a series of notes grading gradually down the scale. Those records I have of it vary from seven to eighteen notes to a call, but the average seems to be about twelve. The pitch is about three octaves above middle C of the piano, about where the voices of the lower-pitched song-birds range. The call sometimes grades so gradually downward that the change in pitch from one note to the next is only about a quarter of a tone. One record, for example, starts on E, consists of thirteen notes, each a quarter of a tone lower than the one before it, so that the last note ends on B flat. Other records do not show such regular change in pitch, but drop abruptly at the end, or run along on one note without change of pitch at either the beginning or the end.

Color. In late summer, many birds seen were juveniles. They were easily distinguished from the adults by the lack of black in throat and breast. They were often quite yellowish in appearance. There seemed to be less difference in this species between the adults and young in color of bill and feet, young birds possessing dull yellow bills and greenish yellow legs, colors that are similar but somewhat brighter in adults.

FLORIDA GALLINULE. *Gallinula chloropus cackinnans* Bangs

Occurrence. The Florida Gallinule (Pl. 7, Figs. 2, 3) is one of the most abundant, conspicuous, and familiar birds of the New York marshes. It is known to inhabitants of the region by the exceedingly appropriate name of "Water Chicken." It is common in all the marshes and areas of cat-tail except those where there is no open water.

Habitat. The habitat of this bird requires two things: open water, preferably with a covering of duck-weed, and cat-tail or other vege-

tation in which to hide. The open water may be pool, stream, pond, or lake. Where pools occur in early summer, and dry up to mud-holes later, the Gallinules leave them as soon as the water is gone and congregate about the streams or ponds where water still remains. The vegetation is most commonly cat-tail, but it may be rushes, bur-reed, arrow arum, reed canary grass, or swamp loosestrife. The Gallinule feeds in the open water, and retreats to the shelter of such vegetation at the approach of danger.

Nesting. Observations were begun too late in the year to find occupied nests of this species easily. We found many empty nests that undoubtedly had belonged to the Gallinule. These nests were flat, and constructed mainly of cat-tail stalks, and placed at the base of cat-tails, arums, etc., near open water. Often two or more nests were close to each other.

Young, as an evidence of nesting, were found frequently; in fact, the majority of birds seen throughout the summer were young, in different stages of growth and plumage. In July both downy young and well-grown immature birds were to be seen. Small downy young were observed until August 2. A young bird not long from the egg was captured and banded in the Sink Hole Marsh July 23. A brood still possessing black down was seen at the Byron Mill Pond, August 10, and birds only partly through the post-natal moult were seen near Clyde, August 16. These young of various ages would indicate that there are certainly two and perhaps three broods of young in a year. The first nests are reported in May, and downy young in early August would indicate that eggs might be found till late in July.

Care of Young. Young birds are commonly seen in the care of parents when in the natal down, but are generally without parental care after the post-natal moult, which takes place when they are about half-grown, and I should judge about two weeks old. Small young are fed by the parents (Pl. 16, Fig. 14). Commonly only one adult is seen with a brood of young, but I have seen two adults feed the same young bird, and therefore believe the male helps in the care of the young. They follow the parents about, swimming over the water and calling for food in a high-pitched whining voice. When parental care is over, flocks of young Gallinules, evidently all the same brood, remain together, and seem fond of each other's company. Rarely does one see an immature Gallinule all alone.

A most interesting habit of this species in feeding young was not observed at all during 1923, but was observed later and seems worthy of record. This observation was made in a marsh at the



Fig. 131. A Green Heron at a mud-hole in the Sink Hole Marsh. August 18, 1923



Fig. 132. Another pose of the Green Heron shown in figure 131. August 18, 1923.



Fig. 133. A third pose of the Green Heron shown in figures 131 and 132.



Fig. 134. A nest and eggs of the Green Heron near Otter Lake. Photo by C. E. Johnson. July, 1923.

east end of Lake Onondaga, within the limits of the city of Syracuse, a spot not altogether attractive owing to the proximity of railroad tracks and dumping grounds, but one containing much bird life and a locality I have visited often during spare time each summer since 1921. The observation was made on August 2, 1924, when, approaching the marsh, I made out an adult Gallinule and three downy young. The old bird fed the young in much the same manner that I have noted previously. Then she swam out of sight into the cat-tails. A moment later a full-grown bird in immature plumage appeared, and the young, with their characteristic hunger notes demanded food, and to my surprise the immature bird fed them. This was observed several times, and a little later another brood of three downy young was observed a little distance away, and they too were fed by another immature bird, though later they had an adult bird with them and feeding them.

I have read of this habit in accounts of the English Moor Hen (cf. Morris, '91) where young of the first brood are said to care for and feed young of the second, but I am not aware that it has been observed before concerning the American bird. I confess some skepticism when I first read of such a human proceeding, but having seen it my doubts are gone. There may be some question however that the immature bird feeding the young is offspring of the same parent, and therefore belongs to the same household.

Feeding. Gallinules feed largely on the surface of water, swimming about (Pl. 16, Fig. 9) and picking over the surface (Pl. 16, Figs. 12, 13, 15) as the Wood Duck does, probably getting both vegetable and insect food. They also feed on mud flats at the edge of water, as do rails, and undoubtedly glean some food from the marsh vegetation. Sometimes they stand at the edge of a pool gathering food (Pl. 16, Fig. 3) in a manner that suggests the fishing of herons and bitterns. What they eat cannot be determined often. I obtained no evidence of any food except vegetable matter. They often clearly ate duckweed (*Lemna minor*) and would swim about gathering it from the surface of a pool and eating it, opening and shutting the bill (Pl. 16, Fig. 8) with a chewing motion as they did so. They also ate bladderwort (*Utricularia*) in this manner. One of the last observations I made was that of an immature Gallinule climbing up into a swamp loosestrife to reach and eat berries of the purple nightshade.

Voice. It would probably be impossible for anyone to describe completely and accurately all the calls of the Gallinule. The more one hears them, the more certain this fact becomes. Yet one comes

to learn to know the Gallinule's voice when he hears it, however variable the calls may be. After considerable study of the various calls, I worked out the following summary of them, which, while far from complete, will give a fairly good idea of the commonest calls to be heard in New York marshes. A single note from a Gallinule may sound like "ka," "kah," "qua," "quat," "krah," "kak," "kuk," or "kut," varying in individuals. An old bird with young frequently calls such a single short note. A series of such notes are often put together when a bird is startled, when it calls "qua qua qua qua" or "kak kak kak kak," for example. More rarely a series of three or four such notes are delivered more slowly with slightly rising pitch.

A longer and more complicated vocal performance, one heard very commonly, starts with a series of quahs, kahs, kuts or other sounds. After eight or ten such notes in even or slightly retarded time, usually rising slightly in pitch on the first two or three notes and falling on the remainder, the call is terminated by five or six notes that slur downward. These are like "qua-ah" "ka-ah" or something similar. They are delivered more slowly than the first notes and are likely to retard still more toward the end. The whole performance suggests in time and pitch the retarded call of the Yellow-billed Cuckoo. It is still more like the long call of the Laughing Gull. Yet it is different from either in quality, being louder and clearer than the Cuckoo, and higher pitched and less nasal than the Laughing Gull.

This long call is delivered as though it were a song, a bird calling suddenly from the heart of a marsh when there is no special provocation. While it would be difficult to prove that only males use this call, and this may not be the case, yet one may easily believe that its chief use is to attract a mate or protect a territory or both. I have never seen the call used by any birds but adults. When one bird calls, it is frequently answered by a second and then a third, and so on. No two calls are ever just alike. The first bird, for example, may call "quat, quat quat quat quat queeah --- queeah --- queeah --- queeah"; and after a moment or so of silence, a second bird calls from another side of the marsh: "ka ka ki ki kah kah ka-ah --- ka-ah --- ka-ah --- ka-ah." Then a third calls "ke ke ke ke ke --- kreeoh --- kreeoh --- kreeoh --- kreeoh."

Another call, given in the same manner as this one, but less commonly heard, is one the time and arrangement of which suggests the common call of the bullfrog. The pitch is about an octave higher

than that of the frog. It varies in individuals, as does the first call, and variations might be written "quutawut - - quutawut - - quutawut," or "kakakuk - - kakakuk - - kakakuk," or in various other ways. I compared the first call to that of the Yellow-Billed Cuckoo. This one is not unlike that of the Black-billed Cuckoo in time. Sometimes this bullfrog call is added at the end of the long call, or takes the place of the slurred notes of that call, but more frequently it is given by itself.

Downy young call "weeah weeah weeah" in a squeaky, high-pitched voice. The call evidently denotes hunger and desire to be fed, for it increases when the parent approaches. At times it is given continually at such regular intervals of time that it suggests a rotating wheel that needs oiling and squeaks once with each rotation. Immature birds give the same short notes as adults when startled, but otherwise are generally silent.

Sociability. Gallinules are very sociable birds. Not only were nests that I believe belonged to this species often close together, but the birds were nearly always in company. This is particularly true of the young birds of apparently the same brood, at least all about the same age, keeping together even when full grown. One may often see a group of Gallinules standing together on the border of a pool, at the mouth of a muskrat runway or some similar place.

Swimming. Gallinules are good swimmers in spite of the fact that their feet are neither lobed nor webbed. When one considers the weedy water in which they prefer to swim, it is apparent that a foot that is not webbed is more of an advantage than the webbed or lobed kind, and this is perhaps the reason why the bird remains in the weedier places and is less frequently seen than ducks in the clear open water. When swimming, the head and neck jerk back and forth. When swimming through thick water weeds, the neck is stretched out to the front (Pl. 16, Fig. 10) as if making considerable effort. At such times, one may often see the feet lifted forward out of the water (Pl. 16, Fig. 11) in front of the bird's breast, first one, then the other, showing that they are used alternately as when walking. When a bird wishes to cross a stream or pool rapidly it swims in preference to flying, unless the water weeds are extremely thick, when it may swim a few strokes, then flap its wings and half run, half fly over the surface. Where weeds are extremely thick, it may sometimes be able to walk on their surface above the water.

Flying. When startled far from shelter, Gallinules usually fly to such shelter, though they always show reluctance to fly when any

other method of progression may be used. The flight is labored and heavy, with feet dangling below. The birds flap some distance on the surface before they are able to rise from the water.

Walking and Running. Gallinules walk and run easily over mud-holes or in shallow water (Pl. 16, Fig. 4). They often climb out on logs or stumps, or walk along over logs above the water (Fig. 140). When running through marsh vegetation they carry the head and neck straight out in front of them and lowered (Pl. 16, Fig. 2), the feet being lifted high in front of the body as they progress. Sometimes they climb up into the lower vegetation and are fond of climbing among the branches of the swamp loosestrife.

Bathing and Preening. Like all the marsh birds they bathe and preen frequently. The bathing is performed much like a duck's, the bird sitting in the water and dousing its head and throwing the water over its back and wings. After such a bath, it flaps its wings vigorously, preens the feathers of back, breast and sides with its bill, and scratches the sides of neck or head with its long toes. One bird spent a long time standing on one leg with the other in air, and the head twisted about picking at the toes with its bill (Pl. 16, Fig. 5). Apparently water weeds had been entangled about the foot and could only be removed in this way.

Fighting. Though gregarious in habit, Gallinules are usually peaceable, at least after the breeding season. I have occasionally seen one dart at another that came too near its feeding place. Dr. Johnson noted a dispute between two half-grown birds, in which one bird settled the matter by lifting its foot and deliberately pushing the other backwards, a proceeding that must have been a ludicrous sight when one considers the size of a Gallinule's foot.

Wariness. Gallinules are extremely wary birds, more so than any other marsh bird save the Black Duck. It is not difficult to surprise a group feeding in an open spot, and get glimpses of them as they flap or run to cover, but if one would construct a blind and watch the bird under natural conditions he must wait patiently for some time for birds to appear where they have once been frightened. Their eyes are quick to see motions, and once they become suspicious they hide quickly. If one remains quiet, they have little fear, even though he is not particularly well hidden. Observation of their habits depends mainly on patience and no quick motions.

That the Gallinule, however, may become quite tame when nesting near civilization is shown by observations in the marsh at Syracuse where birds swim about and feed their young in plain sight, and no special attempts at concealment are necessary on the part of the observer, so long as he keeps still.

Plumage Changes. The young Gallinule's plumage changes are of considerable interest. The post-natal moult begins when birds are about half grown. It seems to appear first on the under parts, birds first showing considerable white in the middle of the breast when all the other feathers are still black. Evidently the juvenile plumage is assumed more rapidly by some individuals than others, for one may see several birds together, all of a size and evidently all of the same brood, some birds of which are still mainly black, while others have lost nearly all the natal down.

The immature plumage (Pl. 7, Fig. 3), while less striking than that of the adult, is beautiful in its soft colorings. The light gray head and neck, almost white on the throat, with black beady eyes, suggest in everything but the bill, the head and neck of a pigeon. The white mark along the side is usually present in immature birds but is less conspicuous than in adults, and in some individuals is apparently not pure white but of a somewhat buffy tinge. This white mark, whether in adult or young, is practically always visible in a swimming bird; for the wings, as in the ducks, are folded with the lower edges underneath the feathers of the side. When out of water, the bird rather infrequently droops the wing and hides this mark. The white sides of the under tail coverts seem to be just as conspicuous in an immature bird as in an adult, and they too practically always show. There is always in immature birds a broad patch of white between the legs which is most easily seen when a wading bird tips forward to pick up food (Pl. 16, Fig. 8), with its back turned to the observer.

The white patches beneath the tail of the Gallinule are worthy of special notice. While always visible from side or rear view (Pl. 16, Figs. 7, 8) they are most conspicuous when a bird is startled and is climbing out of the water or running into the shelter of vegetation. Then the tail is slightly lifted, and these white marks recall to mind the cottontail rabbit. The Gallinule does not habitually carry the tail erect as do the Rails. I mention this fact mainly because I have seen somewhere a drawing or photograph of a mounted bird in which the tail was erect. When the tail is lifted, it is only slightly so; I have never seen it held at right angles to the back.

Swimming Pose. In swimming the bird normally has the wings folded so that the tips come just above the tip of the tail (Pl. 16, Fig. 9). Sometimes however they assume the "swan pose" that I have mentioned in considering the ducks. The wings are held high in such a case, so that the greater part of the primary feathers projects above the line of the back.

Bill Colors. One most interesting point concerning the Gallinule is the color and changes of colors in the bill of young and immature birds. Bird books have little or no information on this point. I have mentioned under other species that the bill colors of young birds seem less permanent than of adults. Thus, in skins, the bill colors of adults are nearly the natural ones, having faded only slightly, but the bill colors of young birds have changed completely and are not to be relied upon. The newly hatched young Gallinule possesses a bright coral-red bill with a yellow tip. The skin of the forehead beneath the feathers is also red. This point was made out by observation of living birds over and over again, and verified by Dr. Johnson. One young bird was caught and banded, and the bill color thus observed in the hand. Yet this fact is not in the texts discussing this species. One text I have seen (Baird, Brewer and Ridgway, '84, Vol. 1, p. 389) in describing downy young states: "bill yellowish (red in life?)." Someone has evidently observed the red bill many years ago but the evidence was not thoroughly satisfactory. Dried skins, it is true, have yellow bills, but all the small young I observed in life had bills fully as bright red as those of the parents (see Pl. 7, Fig. 10).^{*} Dr. Thomas S. Roberts has recently called attention to this fact, and to the bill color changes that take place later in life (Roberts, '18, pp. 72-73).

This red color of the bill of the newly hatched young does not remain long. Larger young show duller colors, the color fading to dull orange, dull yellow, and finally a dark blackish shade, the latter color being reached about the time of or shortly after the post-natal moult. The bird in immature plumage, after the post-natal moult, possesses a dull-colored bill, the exact shade of which is not so easily described from field observations. This color too does not appear to remain long, for as the bird becomes full grown the bill grows lighter again, full-grown birds in the immature plumage usually having a bill that is dull yellow at the tip, flesh color about the nostrils, and blackish at the base of the lower mandible. Individuals of immature birds vary considerably in bill colors, and since it is not always easy to determine the relative ages, I do not feel as sure of their bill color changes as I do of those of the downy young.

Relation to Other Species. Gallinules, like most other species that swim, seem fond of the company of flocks of Black Ducks. When such flocks alight to feed near them, they swim out among

^{*}It is regretted that the downy young gallinule shown in Plate 7, Fig. 10, is incorrect as to the color of the bill. The bill should be bright red, with a yellow tip (about 3/16 of an inch only), much like that of the adult in Fig. 2.



Drawn by Edmund J. Snyder

PLATE 7. BIRDS OF THE CAT-TAIL MARSHES; MONTEZUMA MARSH, NEW YORK

- 1: Blue-winged Teal (male, eclipse plumage). 4: Least Bittern. 7, 8: Virginia Rail (adult and immature).
 2: Florida Gallinule (adult). 5: Black Tern (adult). 9: Black Tern (immature).
 3: Florida Gallinule (immature). 6: Sora, or Carolina Rail. 10: Florida Gallinule (young).

(All figures $\frac{1}{2}$ life size)

them, but when alarmed the Black Ducks fly, and the Gallinules run or flap to shelter. They also associate with Wood Ducks and Blue-winged Teal. They use the muskrat runways as do the Rails, and once I noted a bird suddenly leaving a runway in which it had been standing, and flapping across the water with a loud, startled, squawking sound. A muskrat emerged from the runway and had evidently frightened the bird. At Crusoe Lake a water snake swam past a Gallinule only a foot or two from it, and neither snake nor bird paid any attention to the other. On another occasion a Gallinule walked out to the end of a log where a painted turtle was sunning itself, and calmly stepped over the turtle, neither creature showing any concern because of the presence of the other.

It is quite probable, however, that the snapping turtle is an enemy of young Gallinules, as it is of young ducks. It is said to catch small swimming birds by the foot and drag them beneath the water, holding them till they drown. A Gallinule that had an injured foot was observed both by myself and by Dr. Johnson at a certain point in the Sink Hole Marsh. It seems quite probable that this injury came from an encounter with a snapping turtle. The bird was one in juvenal plumage. It dragged the foot about after it and seemed unable to swim rapidly or to rest weight on the foot. Yet it managed to get along, and was observed in apparent good health for several days in succession.

YELLOW-LEGS. *Totanus flavipes*. (Gmelin)

Occurrence. The Yellow-legs is a common bird in the marshes in late summer, when on its southward migration. The first bird of this species was noted in the Sink Hole Marsh on July 17. Larger numbers were seen in the same place July 23, and from then on they were common. The birds were abundant at the Byron Mill Pond from August 8 to 14. The last one to be seen in the Sink Hole Marsh was on August 18, and the last one of the summer was seen at Crusoe Lake August 24.

Habitat. The Yellow-legs is not strictly a marsh bird, occurring in open spots about shallow, weedy, or muddy water, on the shores of lakes, pools and streams. It keeps strictly to the open, away from the cat-tails, rushes, etc., never using them as shelter as do the true marsh birds, but trusting to its long wings if danger threatens. It is therefore found in only certain spots in the marshes. At the Sink Hole Marsh, it was most abundant in the area where the Black Terns bred, and occurred at other points about open pools or mud-holes that had not dried up completely. At the Byron Mill

Pond it occurred mainly at the upper end of the pond where the water was so shallow it could easily wade (Fig. 142). At Crusoe Lake the few birds seen stayed in the middle of the lake where water weeds were so thick they could walk on them without sinking.

Feeding. This bird feeds in and about shallow water (Pl. 17, Figs. 1, 2), mud, and water weeds, seeming to get most of its food from the surface. Occasionally the bill is partly submerged in water or mud, but I never saw it submerge the bill completely and probe as the Least and Pectoral Sandpipers commonly do. To get its food it walks over mud flats or wades in shallow water, sometimes going in so deep as to cover the long legs and wet the feathers of the under parts.

Bathing. Most of my studies of this species were made at the Byron Mill Pond, where it was not only abundant but rather indifferent to my presence so long as I did not move rapidly. There it often bathed. To do this a bird would go to the deeper, clearer water forming the mid-channel of the pond, the same spot where the Black Ducks bathed earlier in the morning. There it would sit down in the water (Pl. 17, Fig. 3), remaining still for a time. Then it would splash water over its back and wings, duck its head, and sit still again. When sitting thus in the water its tail was usually half spread, and resting on or just under the water surface. When the bath was over the bird would stand up, stretch its wings and then preen, taking care to go over carefully all the feathers of back (Pl. 17, Fig. 9), wing and breast (Pl. 17, Fig. 6), and scratching with its toes (Pl. 17, Fig. 12) those portions it could not reach with the bill.

Fighting. At the Byron Mill Pond, fighting between Yellow-legs was commonly observed. Why they should fight at this season of the year when the mating season was over and the food supply seemed abundant enough for all comers, is not easily explained. Yet it was a common thing to see two birds stand facing each other (Pl. 17, Figs. 4, 5) with heads and necks up, and bills tilted at an angle a little above the horizontal. After eyeing each other a short time, one would dart at the other, apparently trying to get its bill above its opponent's and strike at the latter's eyes. The second bird would dodge back and then return the attempted blow. They never actually struck each other, and after several such tiffs, one bird would crouch down in front of the other (Pl. 17, Figs. 10, 11) apparently the Yellow-legs way of surrendering, and the other bird would stalk off and pick a fight with some other that had been peacefully feeding. Sometimes the fight varied from this

form and the birds lowered their heads at the beginning (Pl. 17, Figs. 7, 8) like roosters and then fluttered up into the air as they went at each other.

One bird in particular seemed always to have a "chip on his shoulder" and went about fighting first with one and then another, and when it was unable to find a Yellow-legs to fight with, it would try to pick a fight with a Spotted Sandpiper or a Killdeer. Yet all this fighting seemed more like play than in earnest. The victor would evidently not take advantage of his adversary when the latter crouched, just as if there was a definite set of rules governing the etiquette of Yellow-legs fighting. Probably fighting in the spring on the breeding grounds is a much more serious affair, and the purpose of this fall fighting may be mere practice for the contests of the mating season.

Certainly had the belligerent Yellow-legs desired a real fight at the Byron Mill Pond he could have had it, for at a certain point lived a mother Killdeer and two young and all the other shore birds kept away. Whenever one lighted near that spot it was charged by the mother Killdeer, who was evidently deadly in earnest about it. The bird so attacked, whether Yellow-legs, Sandpiper, or another Killdeer, always retreated quickly. I did not see the belligerent individual go that way, at least when I was sure of its identity, but I believe it would have retreated as the others did before the attack of the mother Killdeer.

In the Sink Hole Marsh, particularly, this bird showed a liking for the company of the Killdeer, and flocks fed together or flew about together that were composed of mixed Killdeers and Yellow-legs. Although the Killdeer appears smaller than the Yellow-legs on the ground, the length of wing in the two species is nearly the same, so that their sizes appear about equal when flying about. This bird also associated with the other shore birds more or less, the species with which it was seen being Least, Pectoral, Spotted and Solitary Sandpipers, and Semipalmated Plover.

Voice. The Yellow-legs was a noisy bird most of the time, although it was exceeded in this respect by the Killdeer, and at times the Black Tern seemed a close second in the production of noise. While there is a general resemblance between the calls of this species and those of the Greater Yellow-legs, I should say that the calls of the smaller birds are much more variable. Some of the calls are a series of clear whistles and some are chatter-like. The Greater Yellow-legs in my experience has seldom more than five or six notes in its call, and these almost invariably fall downward

in pitch. This lesser Yellow-legs may, however, have a dozen to fifteen notes in a call, and the pitch sometimes varies upward as much as downward. A low-pitched call sometimes heard ends in a long rolled note, sounding like "ta ta ta ta tatatatr-r-r-r-rrrrrrr." Another call contains slurred notes and is like "teeah teeah teeah tayah tayah." Once or twice I heard a rolled call that actually varied in pitch like a true musicians' trill, first up and then down in rapid succession.

KILLDEER. *Oxyechus vociferus* (Linnaeus)

Occurrence. The Killdeer is an abundant bird in central New York, and while not confined to the marshes, it often feeds in and about them and is a conspicuous part of the marsh bird life. It was found in all localities visited, and occurred either in or about marshes in these localities.

Habitat. While the Killdeer nests and lives a large part of the time in open pastures and plowed fields and similar places that are not marsh, it feeds in open places in the marshes, about mud flats, shallow water, and the edges of pools. Its habitat in the marshes is similar to that of the Yellow-legs, though it will never feed in such deep water, not being equipped with long enough legs to do so.

Nest and Young. The Killdeer nests commonly in this region, but probably never in the marshes. Downy young were seen a number of times. One was caught and banded July 7, on the edge of a marsh south of Otter Lake. Another was caught and banded in a plowed field near Crusoe Lake July 13. A brood of half grown young was observed on the border of the Byron Mill Pond practically throughout our stay in that region.

This brood of young was accompanied by a parent. They occupied a certain section of the shore of the pond, where the young hid beneath the rushes when danger approached, and ran over the mud flats at other times. The parent remained near, and drove all other birds from the vicinity. While shore birds and marsh birds were abundant all around the Mill Pond, at this point they kept away because of the parent Killdeer. The parent was extremely belligerent, and I watched it attack other Killdeers, Yellow-legs, Spotted Sandpipers, Soras and Song Sparrows that happened to wander into the vicinity. All these birds seemed glad to leave the vicinity.

Feeding. The Killdeer feeds like the other shore birds, picking over the surface of mud flats or in shallow water (Pl. 18, Figs. 10, 11). I have never seen it probe in the mud, nor wade much in deep water to feed.

Bathing. Like other birds in the Marsh, when feeding is over, the Killdeer bathes and preens. In these actions, it proceeds much as does the Yellow-legs, sitting in the water (Pl. 18, Fig. 13) and splashing water over its back and wings; then stretching the wings, shaking off the water, and preening with the bill or scratching with the feet.

Fighting. The Killdeer fights occasionally, though these fights were less frequent than those of the Yellow-legs and seemed even less in earnest. Fighting birds usually crouched facing each other, and then suddenly would jump toward each other with wings fluttering, and then crouch again. The fight often ended in a mere display performance, and two Killdeers often crouched near each other to display rather than to fight.

Display. This display performance looked much like courtship, and perhaps it is used in that way in the spring. I could attach no special significance to it at this season. Two birds would crouch side by side (Pl. 18, Fig. 12) but facing in opposite directions. Then they would droop the tips of the wings so that they exposed the ochraceous patch of the lower back, spread the tail, and tip the breast forward, slowly lifting the wing tips till they came way above the back, but never covered it from view. All the while they kept up a continual call, the long trilled note: "t-r-r-r-r-rrrrrr."

The displaying birds would often begin the performance, or end it, with a little fighting, so I felt no certainty as to whether they were of opposite or the same sexes. In fact, the whole performance was a mystery. I watched it most frequently at the Byron Mill Pond, when the birds performing were standing in shallow water, and often got the feathers wet by this performance. I have seen a single bird go through a display something like this in the nesting season, when I always believed its purpose to be to lure me from the vicinity of its nest or young. Now, however, such could not be the case.

Relation to Other Species. Killdeers associated with Yellow-legs considerably, and also with the other species of shore birds, but they often left and flew off by themselves to some upland field where the other shore birds did not care to go. Except for the parent with young, they did not fight or attempt to fight with other species, but when a Yellow-legs tried to pick a fight, they usually backed away, or flew off. In the Sink Hole Marsh I once watched one chased by a Kingbird when it had happened to fly too near the latter's perch.

Voice. The Killdeer is undoubtedly the noisiest bird in the marsh. The calls are mainly of three sorts. The first is the common call heard when one approaches one or more birds, or the vicinity of a

nest: "dee dee dee dee-ee dee-ee kildee-ee dee-ee" etc., the notes usually slurred slightly upward on the end, at least the longer ones. A second call is the long trilled "t-rrrrrrrrrrrrrr," often heard when nest or young are threatened, and when birds are fighting or displaying. The third call is the one from which the bird evidently has derived its name. It is usually indulged by birds flying about in the air in loose flocks, particularly early in the morning or toward evening. A number of observers or writers on the notes of this species seem not to have separated this call from the first one. It differs always by the fact that the notes slur downward, instead of upward, on the end. I should write it "kildeeah kildeeah kildeeah," at least in those forms where the first note is lower in pitch than the second. It is often rendered, however, when the first note is highest in pitch, when it sounds more like "keedeeah keedeeah." At the Byron Mill Pond, I heard this call one morning half an hour before the first signs of dawn, when I was making my way to the point from which I watched the morning feeding of the Black Ducks.

BELTED KINGFISHER. *Ceryle alcyon alcyon* (Linnaeus)

Occurrence. While the Kingfisher is not strictly speaking a marsh bird, yet it lives constantly in the vicinity of water, and when one sits quietly by a marsh stream waiting for true marsh birds to appear, this bird is about as much in evidence as any other species. Frequently, when there were no other birds about, I watched the Kingfishers. Often a small bush or tree overhanging a pool, near a spot I had chosen for a blind, would prove a favorite perch for the Kingfisher (Pl. 19, Fig. 7). The bird was extremely common in the vicinity and was seen practically daily about marsh streams, ponds, or lakes. It was abundant along the Barge Canal. But it was of course not noted in those marshes, far from water that would contain fish.

Nesting. Undoubtedly the Kingfisher nested commonly in the vicinity, but the nests not being located in marshes, we found none that were occupied, though we frequently saw holes in banks along railroad cuts, roadsides, and on the edges of the Barge Canal, that were undoubtedly the work of this bird. A large number of the birds seen and watched in late summer were young, as shown by the dull rusty appearance of the band on the breasts.

Fishing. The fishing of this bird is so familiar, and has been described so fully by others, that there is little I observed that would contribute anything new. Two or three birds often fished near



Fig. 135. A Great Blue Heron in the Sink Hole Marsh. August 3, 1923.



Fig. 136. A Sora Rail at the Byron Mill Pond. August 13, 1923.



Fig. 137. An immature Virginia Rail probing for food in the Sink Hole Marsh.
August 20, 1923.

each other, perhaps young of the same brood. Fish seemed abundant in the marsh streams, and the birds plunged over and over again, catching fish more frequently than they missed. Most of the fish caught (Pl. 19, Fig. 8) were one or two inches long. Some were longer, and one I judged to be about five inches, though the bird carried it out of my sight so quickly I had only a short glimpse of it. Along the old abandoned Erie Canal at a point a mile or two west of Clyde, I watched a bird of this species with a fair-sized sunfish (*Lepomis* sp.) in its bill. The bird was attempting to swallow the fish, head first as is always the case (Pl. 19, Fig. 9), and held it with the head partly down its throat, and the lower half of the body and tail projecting. The fish was evidently too broad for the width of the bird's throat, and though I watched it some time, it was unsuccessful in swallowing the fish and finally flew out of sight with it.

RED-WINGED BLACKBIRD. *Agelaius phoeniceus phoeniceus* (Linnaeus)

Occurrence. This species is abundant in all the marsh areas visited. Owing to the fact that it is already well known, less attention was paid to it and its habits than to other marsh birds. The birds however were conspicuous and easily observed. They were noted constantly and practically daily throughout the summer. Empty nests and young recently out of the nest were found, the latter in early July. No occupied nests were found, probably because the species had finished or nearly finished nesting early in July.

Dr. Arthur A. Allen, in his paper on the ecology of this species, brings up the question of the supposed disappearance of the species in mid-summer, concluding that the birds probably retreat to the heart of large marshes and are therefore not commonly seen in late summer. I find that my daily records show that this species was present in the Sink Hole Marsh throughout the summer. Except on the 4th, 6th, 7th and 21st, I observed this species every day in the month of August. The days I missed it were days that I was not in the regular marsh areas, but in places where it was less likely to be expected. These dates show, however, that the Red-wing is not to be found in many places in late summer where it would undoubtedly be common early in the year. Thus, August 4 was spent at Rector's, a place where Red-wings were common enough July 14. August 6 and 7 were spent in some disappointing small marsh areas near Golah, New York, and no Red-wings were there at that time. August 21 was spent on Butler Creek north of Crusoe Lake.

In the latter part of August, Red-wings were seen frequently in large flocks, and then they were often not in marshes, but in cultivated fields or flying about. On August 26, at Clyde, flocks flew by toward the southeast an hour or two before sundown. I noted about twenty flocks, each flock numbering from fifteen to fifty birds. They were apparently going to the southern part of the Sink Hole Marsh to spend the night. I watched for them again the two following days but they did not appear, and hopes of tracing their flight and finding exactly where they went were given up. These flocks, and those seen in fields, were all males.

That all Red-wings are not in the heart of large marshes in August was shown by the occurrence of a small number of these birds daily at the Byron Mill Pond. Here were both males and females and they fed along the muddy shores of the pond, often walking about among shore birds and Soras.

Singing. The song of this species ceases in July. This year I noted it daily till July 15, and after that heard it on the 21st, 22nd, 23rd and 27th. I did not hear it at all in the month of August. A great many individuals evidently ceased singing before the middle of July, for I noted as early as July 9 on Muskrat Creek that the amount of song of this species seemed to be lessening.

Like Kingbirds, Red-wings often pursue hawks. They do so however, in flocks rather than singly or in pairs. They were noted in pursuit of hawks many times, the hawk most commonly being a Marsh Hawk. Often Kingbirds and Red-wings together pursued the same hawk.

SWAMP SPARROW. *Melospiza georgiana* (Latham)

Occurrence. The Swamp Sparrow was a common bird in this region and found in all the marshes visited except about the Byron Mill Pond. It seemed to inhabit cat-tail marsh, grassy marsh, and swampy thicket, and was perhaps most abundant where marsh and swamp came together, though it was not uncommon in the heart of large areas of cat-tail where no bushes were near. In grassy marsh areas, where grasses, sedges and tall weeds formed the main vegetation, it was the only species of true marsh bird certain to be found in numbers.

Food Habits. The general habits of the Swamp Sparrow seemed much like those of the better known Song Sparrow in many respects. Often the two species were found together or very near each other. The feeding habits seemed much alike, the Swamp Sparrow being often seen about the borders of pools and streams

feeding in the wet vegetation. Only once was the character of food taken made out, and this time the food was berries of the red-osier dogwood (*Cornus stolonifera*).

In certain swampy woods, about the middle of July, there occurred in large numbers a white moth of the family Geometridae. The moth was pure white in both wings and body and about an inch in expanse. It proved a common food of many birds inhabiting this area. Swamp Sparrows were common here and I watched one chase one of the moths, though it was not successful in capturing it. I did observe these moths eaten by the Song Sparrow, Phoebe, Water Thrush and Mourning Warbler. It was interesting to note that the warblers swallowed them wings and all, but the other birds discarded the wings. The ground in these swampy woods was strewn with the white wings of the moth, and yet there were many living ones left to fly up as I walked through the areas. This was observed north of Cross Lake in Cayuga County, and above Crusoe Lake in Wayne County.

Singing. During July the Swamp Sparrow sang regularly and abundantly. Early in August the abundance of song fell off. The last regular singing was on August 5, but the song was heard after that date on August 17, 18, 23 and 27.

Although the song of the Swamp Sparrow is quite simple in form, so much so that the commonest description one reads of it is that it is similar to the Chipping Sparrow, yet it is really subject to a surprising amount of variation. It commonly consists of eight to twenty notes, of even rhythmic time, twelve notes being about the average. These notes vary in quality, but are nearly always more musical than those of the Chipping Sparrow, and sometimes fully as musical as those of the Song Sparrow. These notes are never so fast that the separate notes cannot be counted, another point in which the song differs from that of the Chipping Sparrow. The notes are not always on one pitch, but the pitch falls or rises toward the end in some cases. In many cases the notes are on two pitches, a single note sounding like "tuwee," or "teooo," the first pitch being short, and the second longer and accented. A number of songs were double, there being an undercurrent of lower-pitched notes audible when one was near the singer, the two pitches being from one and one-half to two and one-half tones apart. More rarely still, a song began with four to six notes that were extremely variable in pitch, ending in the normal manner. One such song as this, heard at Parker Pond, July 6, was sung in flight.

Nesting. The Swamp Sparrow undoubtedly nested commonly here. We found no occupied nests, however, though we found a number of young out of the nest, and early in July were frequently scolded by a parent bird that evidently had young near. In August, a large proportion of the birds seen were birds in the streaked juvenile plumage. On August 25 adults were seen that appeared to be moulting into the winter plumage, particularly about the head.

LONG-BILLED MARSH WREN. *Telmatodytes palustris palustris* (Wilson)

Occurrence. This little bird was the commonest passerine bird in the true marsh areas, and the only one whose distribution was entirely confined to the marsh. It was found in all marshes visited. About Otter Lake, Parker Pond and Crusoe Lake it was exceedingly abundant; in the last locality there seemed to be one nest to every ten feet of lake shore, on an average. Of course a large number of these nests were dummies, but nevertheless birds of this species were exceedingly numerous.

I have previously stated (Saunders, '22) a belief that this species prefers the narrow-leaved cat-tail (*Typha angustifolia*) to the broadleaved (*Typha latifolia*). After a study of marsh conditions for one summer, I am still of the opinion that this is generally true, although the statement must be modified to some extent. The great majority of nests (Fig. 145) found were in narrow-leaved cat-tail. A few were in rushes (*Juncus effusus*), and this plant seemed to be the attraction for this species at the Byron Mill Pond, where the only cat-tails were the broad-leaved. One nest was found at Otter Lake in the broad-leaved cat-tail. It was an occupied nest, but this one only, when compared to the hundreds found in narrow-leaved cat-tails, seems to prove the point pretty well. One or two nests were found built in buttonbush (*Cephalanthus occidentalis*), one was found in reed canary grass (*Phalaris arundinacea*) and one in a sedge (*Scirpus*). At one locality birds were seen among bur-reed (*Sparganium*) and sweet flag (*Acorus*) where there were no cat-tails or other species to attract them, but a nest was not found there.

Nesting Habits. Nesting was going on early in July. It was impossible to examine all the nests found, for if we had done so, there would have been time for nothing else. We examined a few, however, and found both eggs and young in various stages early in July. The last occupied nest was found near Byron, August



Fig. 138. An immature Virginia Rail feeding at a mud-hole in the marsh.
August 22, 1923.



Fig. 139. Another view of the Virginia Rail shown in figure 138.



Fig. 140. An immature Florida Gallinule on a log that reaches back into its safe haven of swamp loosestrife. August 23, 1923.

13, in a clump of rushes, and contained half-grown young. On Muskrat Creek a pair of birds was observed feeding young. Both sexes fed the young and cleaned the nest,—after visiting the nest reappearing with excreta in their bills. The male seemed to have established a headquarters for singing in a clump of cat-tails about twenty feet from the nest and across the creek from it.

Singing. A study of the song of this species shows it to be extremely variable. Songs usually contained ten to sixteen notes. A majority of these are generally all on the same pitch, but songs begin or end with rises or falls in pitch, and this pitch variation is so wide that no general rule can be obtained from a study of the songs recorded. The quality is usually guttural, this being the point about the song that distinguishes it from all other species. Occasional songs or parts of songs were squeaky in quality. The song period continued through the first half of July, began to lessen after July 15, was heard daily however till July 23, but after that date was heard only on July 26, 31, and on August 7. The birds however were abundant in the marsh throughout the summer, being about as much in evidence after the song period had ceased as before, and being observed daily.

My notes on other species of birds seen during this period in or about the marshes, but either rare or not normally inhabiting the marshes exclusively are as follows:

GULL. *Larus* sp.

Nine gulls flew over the Byron Mill Pond on August 13, six in one group and three in another. They were either Herring or Ring-billed Gulls, but were too far off to be certainly identified.

MALLARD. *Anas platyrhynchos* Linnaeus

Mallards were reported to breed in small numbers in this region by various persons. We saw none however until August 24, when at least three were observed with Black Ducks on Crusoe Lake. These were all birds in female plumage, identified by the lighter color than the Black Ducks, and by the white-bordered speculum.

GOLDEN-EYE. *Glaucionetta clangula americana* Linnaeus

Perhaps the most unusual observation of the summer was that of an adult female Golden-eye on the Barge Canal, east of Savannah, and less than a mile south of the point where the canal is crossed by the New York Central Railroad tracks. The bird was

seen July 31, a time when it should have been far away on the breeding grounds. The bird was swimming in the canal, and we approached it with a boat. It was reluctant to fly and flew only short distances, and finally swam down past us about a hundred feet distant, and where we could observe it in good light. Not only were the brown head and white underparts and wing patches clearly visible, but even the yellow iris could be made out with glasses. Dr. Johnson verified my identification.

KING RAIL. *Rallus elegans* Audubon

On August 22, toward the end of the day's work, I stopped for a few moments at the edge of a mud-hole in the Sink Hole Marsh to await Dr. Johnson's return from the portion of the marsh he had visited. As I sat there, a King Rail in adult plumage poked its head through the cat-tails on the opposite side of the mud-hole. I had been observing Virginia Rails all afternoon, so that the contrast in size was instantly noticeable. The bird came into sight two or three times, but gave me no opportunity to observe much of its habits, and disappeared before Dr. Johnson could arrive and verify my identification. I waited at this point with my camera set several hours the following morning, but did not see the bird, nor another of this species again.

COOT. *Fulica americana* Gmelin

In 1923 we did not meet the Coot in any of the marshes visited. Mr. Vanderbilt believed it bred in the Sink Hole Marsh and was surprised that we did not find it. It has not been reported a common breeder in New York State, however, but formerly bred in small numbers in the Montezuma Marshes. On Aug. 2, 1924, I was surprised to see a Coot in the marsh at the east end of Lake Onondaga, in Syracuse. After noting it I searched and made out four others, and a little later a fifth adult emerged from the cat-tails followed by five half-grown young, and later still another bird with a brood of six. I had been more or less familiar with the birds of this marsh since 1921, and had never seen this species there before. It reported, however, to fluctuate in abundance from year to year.

The fact that the Coot did not occur in the Sink Hole Marsh I attributed to the small amount of open water, but this could not have been the case at such places as Crusoe Lake. However, there is a good-sized body of open water in this Syracuse marsh, larger than those in the Sink Hole Marsh. The habits observed

were much like those of Gallinules, but one parent led her brood a considerable distance out into the open water, farther than Gallinules like to stray from the shelter of the protecting cat-tails. One bird was observed to dive, a thing I have not seen the Gallinule do.

WOODCOCK. *Rubicola minor* (Gmelin)

Some of the swampy thickets we traversed would seem to be favorable spots in which to find breeding Woodcock. We found none in such localities, however, and saw but one bird all summer, a bird that flew past about sunset on the evening of July 26, when both Dr. Johnson and I were observing together in the heart of the Sink Hole Marsh. The locality was more open than that in which I would normally expect a Woodcock to be.

WILSON'S SNIPE. *Gallinago delicata* (Ord)

This species was first noted in the Sink Hole Marsh on August 1 and again August 3, near the point where the Black Terns bred and the Yellow-legs fed. The fact that it was not seen here on previous visits led me to believe that it did not breed here but moved in from some point near by. Another bird was seen along Black Creek near the Bergen Swamp on August 8, and another at the Byron Mill Pond, August 12. This last bird was observed feeding by probing in the mud with its bill (Pl. 18, Fig. 2). Although all alone, so far as its own species was concerned, it went through a curious display performance, lowering its breast till it almost touched the mud, and spreading its tail (Pl. 18, Fig. 3) in a manner that showed off the rufous band near its tip. In this display the tail was erected at right angles to the back. I could not help comparing this performance with the display of the Killdeer which shows off patches of similar color on its lower back, and wondering why these two species should have such similar habits and such similar coloring in the portions displayed. That the purpose in each species was to display this color seems evident from the fact that the performances are different in the two species to the extent that the distribution of the color is different. In the Killdeer the color is on the lower back, and the bird lowers its tail that the back may show. In the snipe the color is on the tail, and the tail is therefore not lowered, but erected.

PECTORAL SANDPIPER. *Pisobia maculata* (Vieillot)

First observed in the Sink Hole Marsh July 26, when a small flock was seen. Most of my observations of this species were at

the Byron Mill Pond, where from one to three birds were seen regularly from August 8 to 13. A flock of sixteen birds was seen in a marsh near Clyde on August 16.

As observed at the Byron Mill Pond (Pl. 18, Fig. 4) the habits of this Sandpiper and of the smaller Least Sandpiper seemed much alike. They fed by submerging the bill in the mud for its full length. They bathed by sitting in the water in a manner similar to that described for the Yellow-legs and the Killdeer.

It may be of interest to add here that this species was seen in a marsh near Syracuse, July 2, 1922, a date that might be in either late spring or early fall migration; but most likely it was a non-breeding bird that had lingered south of the breeding locality.

LEAST SANDPIPER. *Pisobia minutilla* (Vieillot)

This Sandpiper occurred as a migrant in the marshes in late summer, the first birds being seen near the Black Terns' breeding grounds on July 17. They were common here until August 3, common at the Byron Mill Pond from August 8 to 14, and last seen in the Sink Hole Marsh again August 18. The habits were very similar to those of the Pectoral Sandpiper mentioned above, (Pl. 18, Figs. 5, 7), the birds feeding on the muddy shores by probing with the bill (Pl. 18, Fig. 6) and being fond of bathing when hunger was satisfied.

SEMIPALMATED SANDPIPER. *Ereunetes pusillus* (Linnaeus)

This species was seen certainly only on the Byron Mill Pond from August 8 to 12. Seven birds were seen on the first date, and lesser numbers later. No observations were made on their habits.

SOLITARY SANDPIPER. *Tringa solitaria solitaria* Wilson

This species was a common migrant. It was first observed near Otter Lake July 7, but was not noted again till July 23. From that date till August 19 it was seen frequently, being common in the open parts of the Sink Hole Marsh and seen regularly at the Byron Mill Pond. True to its name it was never seen in large numbers, there usually being only two or three in a place and often only one. It associated more or less with other species, however, feeding in much the same manner as the Yellow-legs but was not nearly so noisy, seldom uttering a sound, and never showing the belligerent character of the Yellow-legs.

SPOTTED SANDPIPER. *Actitis macularia* (Linnaeus)

This bird was a common one in the region visited, undoubtedly breeding, but not particularly a bird of the marshes. In fact it was less so than the other shore birds. It occurred, however, at Crusoe Lake, where it fed on the surface of the water weeds in the middle of the Lake; was common at the Byron Mill Pond with the other shore birds; and was abundant along the borders of the Barge Canal. In this region it is a stream border inhabitant, rather than a bird of marshes, and its occurrence in marshes was only occasional. Along streams where there were no marsh areas, it was likely to be the only shore bird found. This was the case, for example, along Black Creek near the Bergen Swamp where its foot tracks in the soft mud bordering the stream were common (Fig. 144).

At the Byron Mill Pond birds of this species indulged in fighting (Pl. 18, Figs. 8, 9) similar to the fighting of the Yellow-legs and the Killdeer. Occasionally a Yellow-legs and a Spotted Sandpiper fought together, but such battles did not last long.

SEMIPALMATED PLOVER. *Aegialitis semipalmata* (Bonaparte)

Two birds of this species were seen on the Byron Mill Pond on August 8. They were not noted there or elsewhere again.

RING-NECKED PHEASANT. *Phasianus torquatus* Gmelin

Pheasants were abundant in this general region. They were not birds of the marsh except occasionally. They do occur in the marsh at times however. I was much surprised to flush a cock bird from the midst of a patch of cat-tails on the border of the Seneca River west of Howland Island, on July 18.

Dr. Johnson made an extra trip to the Sink Hole Marsh in October, and reported that there were signs that Pheasants roosted for the night in the higher and drier parts of the marsh on stalks of down cat-tails. Excreta showed evidence that they ate berries of the purple nightshade and there was other evidence to show that they ate fruits or seeds of the arrow arum. Both of these are food of Wood Ducks, and perhaps of other ducks also, so there is a possibility that the introduction of the Pheasant may have some effect on duck foods and the abundance of ducks in fall.

MARSH HAWK. *Circus hudsonius* (Linnaeus)

This hawk was fairly common in this region, and undoubtedly hunts to some extent in the marshes. Its true habitat, however, is not the dense cat-tail marsh, but more open marshy meadows. Such

areas were small and not numerous. Marsh Hawks were seen fairly regularly, and were perhaps most abundant about the borders of the marshes south of Meridian along Muskrat Creek. In the Sink Hole Marsh the owner of the area, being interested in trapping muskrats, had discouraged and destroyed the Marsh Hawks as much as possible, believing them to be destroyers of muskrats. We saw few Marsh Hawks in this area.

Whenever a Marsh Hawk appeared over the cat-tails, its approach was heralded by the Red-winged Blackbirds who chased it off in droves. The Blackbirds were likely to be joined by Kingbirds, wherever they occurred, and in the Sink Hole Marsh, Black Terns also often joined in the chase.

OSPREY. *Pandion haliaetus carolinensis* (Gmelin)

A bird of this species was seen flying over Crusoe Lake on July 13. It dived twice while we watched it, but was not successful in catching anything either time. After diving, it would shake itself in air, evidently in order to get the water from its feathers. This was the only bird of this species seen during the summer.

KINGBIRD. *Tyrannus tyrannus* (Linnaeus)

While one does not commonly think of the Kingbird as a marsh bird, the species was nevertheless extremely common wherever there were a few scattered trees or even bushes in situations that were otherwise marsh. About the borders of such bodies of water as Otter Lake and Parker Pond, Kingbirds were common. They were also common along Muskrat Creek, and in the more northern portions of the Sink Hole Marsh. There were not many about Crusoe Lake owing to the scarcity of trees there, but they were common immediately north of the lake along Butler Creek.

Early in the summer nests of this species were commonly found, particularly about the lakes. Some of these nests were built unusually low for this species. One noted at Otter Lake, July 4, was in a swamp loosestrife and only two and a half feet above the water. This nest still contained eggs. Other nests at this same time contained young nearly ready to leave. One nest found in the marsh between Otter Lake and Parker Pond was on the trunk of a willow only three feet from the water.

The Kingbird's habits are well known, and there is little to add to what has been frequently written about this species. One habit that is not commonly mentioned is that of catching insects on or just under the water surface. Kingbirds often did this along the

edges of marsh streams, and often they hovered over the water, watching it carefully in much the same manner as a Kingfisher, plunging down and wetting the feathers of head and breast to catch their prey.

CRESTED FLYCATCHER. *Myiarchus crinitus* (Linnaeus)

In those areas that were partly marsh and partly swampy woodland, dead trees were common. On this account, almost all of the hole-nesting birds were likely to be met with in such localities. Crested Flycatchers were not common, but occurred along Muskrat Creek below Parker Pond, above Crusoe Lake, and in other swampy woodlands, but not in the more open marsh lands.

PHOEBE. *Sayornis phoebe* (Latham)

Wherever a road crossed the marsh, and a bridge had been built across the marsh streams, a pair of Phoebes was likely to be found nesting under the bridge. There was a nest at every bridge crossing of Muskrat Creek, the birds feeding young early in July. There were similar nests at similar points in the Sink Hole Marsh. A nest near Crusoe Lake contained half-grown young July 13.

Like the Kingbirds, Phoebes were often seen catching insects from the surface of the water or just beneath. The birds sometimes plunged into the water and wet their feathers pretty thoroughly in so doing. As suggested one day by Dr. Johnson, it would seem but a step only in evolution between such feeding habits of the Flycatchers, and those of the Kingfisher. The typical pose of a Phoebe is shown in Fig. 143.

ALDER FLYCATCHER. *Empidonax traillii alnorum* Brewster

This bird is an inhabitant of swampy thickets, not marshes, but the two areas are often close together, and in some places areas occur that are half marsh and half thicket. Such areas are likely to be inhabited by this species. About Otter Lake and Parker Pond there was about as much of the swamp area as marsh. In places the water was bordered by dense thickets of swamp shrubs, growing in standing water, at least in July. From the depths of these thickets as we rowed by, the call of the Alder Flycatcher was frequently heard. Occasionally we could see the bird on a tall dead shrub that projected higher than the surrounding shrubbery. The call consists of a short, sharp note, followed by a whistle that slurs downward. I wrote it as "tick-weeoh" and "quit-wheeo" on different occasions. Other calls are described for this species that I did not hear, perhaps

due to either seasonal or geographical variation. At times the bird calls a single call "queet," and once, by imitating such a call, I brought a bird to a branch ten feet over my head. Although this species is supposedly rare we heard it quite frequently in the proper localities. This was during the month of July. Birds became silent later and were not so frequently noted. The species was last noted near Horseshoe Lake, Genesee County, on August 11.

STARLING. *Sturnus vulgaris* Linnaeus

This bird is now not uncommon in this general region, though to one who is familiar with it near the center of its greatest abundance in this country, the numbers seem very few. Most of the birds seen were young of the year, and they occurred in flocks numbering ten to fifty or more birds. They were not birds of the marshes in any marked degree, but they often frequented borders of the marsh, and occasionally came into the marsh itself. They fed on berries of the red-osier dogwood in quantity, berries that seem to be favorites with many smaller birds.

SONG SPARROW. *Melospiza melodia melodia* (Wilson)

Although the Song Sparrow is not particularly a marsh bird in its habits or distribution, it occurs frequently in or about the borders of marshes quite as much as the Swamp Sparrow, a bird that belongs more definitely to swamp or marsh areas. Song Sparrows were frequently to be seen feeding along the borders of marshy streams. They were common at the Byron Mill Pond.

BARN SWALLOW. *Hirundo erythrogastra* Boddaert

While Barn Swallows belong mainly in other localities than marshes, they are nevertheless often seen in and about marshes and gather a large part of their food from the air above marsh streams and ponds. Like the Kingbird and Phoebe, they often gather insects from the surface of the water, wetting the feathers of the head and breast in order to obtain them. Unlike these birds, however, they dip into the water from flight and not from a perch.

In late summer these Swallows use the cat-tails and other marsh vegetation as night roosting places. At the Byron Mill Pond Dr. Johnson and I watched a flock settle for the night on the evening of August 8. They flew down into the cat-tails one at a time, and grasped a stalk with the feet, usually two or three feet down from its top. Their weight would bend over the stalk, and after some balancing and flapping of wings, they would gain their equilibrium

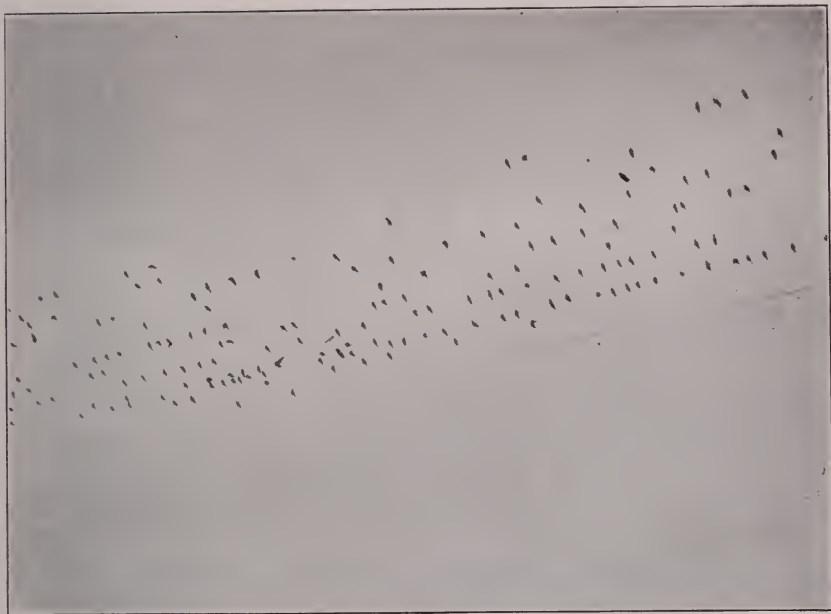


Fig. 141. Bank Swallows lining the telegraph wires near Montezuma Marsh. July 31, 1923.



Fig. 142. A Yellow-legs at the Byron Mill Pond. August 10, 1923.



Fig. 143. A Phoebe on a limb overhanging Muskrat Creek. July 7, 1923.



Fig. 145. Nest of the Long-billed Marsh Wren. These nests are very abundant in the cat-tail marshes, August 3, 1923.



Fig. 144. Tracks of the Spotted Sandpiper, and a single footprint of a raccoon in the mud along a stream border. August 8, 1923.

and perch quietly. Often another bird alighting a few moments later, bending another stalk, would upset the first bird, and that one would change to a new perch. Thus it took a long time for the whole flock to get settled and quiet.

TREE SWALLOW. *Iridoprocne bicolor* (Vieillot)

Like the Barn Swallow this bird occurred in small numbers about water. Young birds not many days out of the nest were seen at Otter Lake July 4. It is probable that this species nests in small numbers in dead trees about the borders of Otter Lake, Parker Pond, and other similar localities.

BANK SWALLOW. *Riparia riparia* (Linnaeus)

Like the other species this Swallow occurred about the borders of marsh areas. It was less numerous than the Barn Swallow but more so than the Tree Swallow. In some localities, such as the vicinity of Montezuma, along the Barge Canal, and the southern extreme of the Sink Hole Marsh, this swallow outnumbered all the others and large flocks were observed perched on wires over or near the marshes (Fig. 141).

ROUGH-WINGED SWALLOW. *Stelgidopteryx serripennis* (Audubon)

Careful study of flocks of Bank Swallows perched on wires occasionally showed a few birds of this species. They were seen on the Clyde River July 19, and near Montezuma July 31.

YELLOW WARBLER. *Dendroica aestiva* (Gmelin)

This bird is a common inhabitant of the swamp thicket, and where such areas border on marshes the species is likely to be seen in the marsh itself, though not unless there are at least a few scattered bushes.

CERULEAN WARBLER. *Dendroica cerulea* (Wilson)

This species inhabits the tops of tall trees in swampy areas. It was noted near a marsh area on the east side of Howland Island. It was also noted north of Cross Lake near Meridian.

WATER THRUSH. *Seiurus noveboracensis noveboracensis* (Gmelin)

This bird is an inhabitant of swampy woodland. In late summer, when it was probably migrating, it occasionally came into the marsh. I was surprised to see one in the heart of the Sink Hole Marsh on July 26. It was feeding in the same soft mud where a Sora had been a few moments before.

MARYLAND YELLOW-THROAT. *Geothlypis trichas trichas* (Linnaeus)

This bird is another common inhabitant of the swampy thicket that was occasional in the marsh. It seemed to prefer grass marsh to cat-tails, but was seldom found except where shrubs were not far distant.

SHORT-BILLED MARSH WREN. *Cistotheris stellaris* (Naumann)

On July 9, on the west side of Muskrat Creek, I found a pair of Short-billed Marsh Wrens in a somewhat marshy meadow of grassland. A small dead alder bush stood in the midst of the meadow, and this served as a "singing tree" for the male. I first found the birds through this song, which is distinctly different from that of the Long-billed Marsh Wren. This song I wrote as "tip tip tip a trrrrrrrr," the first three notes being highest in pitch, the fourth lower, and the final trilled note lowest. The time of the beginning notes suggested a Song Sparrow, though the quality was distinctly different, and also different from that of the Long-billed Marsh Wren, being more musical and less guttural.

I found the female bird in the tall grass near this alder bush, but was unable to locate any nest, though the actions of the birds were such that I thought a nest or young must be near the spot. The chief grasses in the meadow were a species of *Glyceria*, several species of *Carex*, one *Scirpus*, and a small amount of Meadow Grass (*Poa pratensis*) and Red Top (*Agrostis alba*), the *Glyceria* being the predominant species.

VEERY. *Hylocichla fuscescens fuscescens* (Stephens)

This thrush is another common inhabitant of the swampy thicket, that strays occasionally to the border of the marsh or occurs where marsh and swampy thicket come together.

ROBIN. *Planesticus migratorius migratorius* (Linnaeus)

Although the Robin is far from being a marsh bird, it occurred occasionally in or near these marshes where there were trees or bushes. A few nests were found in trees bordering marsh streams, and one nest was under a bridge where a road crossed Black Creek in the Sink Hole Marsh. This nest contained three well-grown young on July 13.

SUMMARY AND CONCLUSIONS

1. Marsh birds are decreasing in numbers throughout the United States.

2. The chief cause of this decrease is the draining of marshes. If such drainage continues, many species will be in danger of extermination.

3. Most marsh species are so highly specialized that they are absolutely dependent on marsh conditions for existence.

4. Marsh birds are of value to man because:

a. Many are game birds, and are therefore a source of recreation to hunters and a part of our food supply.

b. They have a recreational value not simply to hunters, but to lovers and students of nature of all sorts who derive pleasure, health, and mental recreation in observing them.

c. They have an educational value particularly to young people whose average knowledge of nature is at present too small in comparison to their knowledge of the sordid side of civilization, and whose mental development is therefore one-sided, and whose value to the country as intelligent citizens is thereby decreased.

d. They are of value to the scientist whose knowledge cannot be complete unless they remain for him to study in future.

e. They are living creatures, the result, as is man, of long ages of evolutionary creation. While man may have the right to take their lives individually to suit his needs, he should be intelligent enough to consider that the local extermination or complete extinction of any one species is a crime.

5. Drainage of marsh lands in the past has been frequently more detrimental than beneficial to the country's welfare. The soil often proves of little or no value for agriculture. Wild life is driven out or destroyed, and a source of valuable game birds, fur-bearers, and fish is gone. Often the water table is lowered not only in the marsh but at points on streams a considerable distance below. In consequence, springs and wells dry up, fire danger in forested areas increases, underground moisture in certain agricultural areas decreases, and the consequent yield in crops is less. The temperature of waters is often increased so greatly that valuable food fish are unable longer to live in them. Marsh lands, like forests, often act as reservoirs of water. Their removal causes floods and erosion of soil in areas below them.

6. The desire for drainage more frequently arises from some selfish commercial opportunity rather than from a real economic necessity.

7. In future it would be well if those desiring drainage should be required to show the following:

a. That the lands drained will be so greatly increased in value that they will not merely cover the cost of engineering necessary, but also the value of the wild life resources destroyed, whether game, fur-bearers, fish, or plants.

b. That the drainage will not seriously affect the level of water in nearby regions, or cause a drying up of valuable springs and wells, or cause increased fire danger, or cause increased temperature of water to the point where valuable fish will be destroyed, or cause floods and erosion in areas below the marsh.

c. That the proposed drainage is a real economic necessity for the good of all, and not a mere opportunity for certain individuals to make money.

d. That there are other areas of similar character that can and will be saved for all time for scientific study, and that the drainage of the particular marsh in question will not result in the destruction of a unique area or in the extermination of any species.

8. It is highly desirable that some marsh areas be preserved in natural conditions for all time for scientific study. It is possible for the State of New York to set aside preserves in either the area including the Sink Hole Marsh and Crusoe Lake, or the area including Otter Lake, Parker Pond and the drainage of Muskrat Creek or both. The preservation of such areas must include not only protection of the wild life from direct destruction by guns, traps and similar means, but the protection of the area from the much greater menace, drainage.

9. Comparatively few studies of marsh birds, their life histories, habits, ecological relations and value to mankind have been made, and none of these is complete. It is desirable to have such studies made because they increase man's knowledge, and it is always possible that such knowledge will prove of great economic importance in the future. If areas of marsh are set aside and preserved in natural conditions indefinitely we will have opportunity to obtain this knowledge. If all marshes are drained we may never attain it.

LIST OF REFERENCES

ABBOTT, CLINTON G.

1907. Summer Bird-Life of the Newark, New Jersey, Marshes. *The Auk*, Vol. 24, pp. 1-11.

ALLEN, ARTHUR A.

- 1911-13. The Red-winged Blackbird. A Study in the Ecology of a Cat-tail Marsh. Abstr. of Proc., Linn. Soc. of N. Y., Nos. 24-25, pp. 43-128.
1914. At Home with a Hell-Diver. Bird-Lore, Vol. 16, pp. 1-11.
1917. The Behavior of the Least Bittern. Bird-Lore, Vol. 17, pp. 425-430.

AVERY, CARLOS

1923. In Behalf of our Waterfowl. Amer. Forestry, Vol. 29, pp. 547-551.

BAKER, O. E. and STRONG, H. M.

1919. Arable Land in the United States. U. S. Dept. Agri. Yearbook for 1918, Sep. No. 771, pp. 3-11.

BAIRD, S. F., BREWER, T. M. and RIDGWAY, R.

1884. The Water Birds of North America, Vol. 1. Memoirs Mus. Compar. Zoology, Harvard College, Vol. 12, p. 389.

BALL, JAMES S.

1916. Waste Land and Wasted Land on Farms. U. S. Dept. Agri., Farmers' Bull. 745, pp. 1-17.

BARROWS, WALTER B.

1913. Concealing Action of the Bittern (*Botaurus lentiginosus*). The Auk, Vol. 30, pp. 187-190.

BARTSCH, PAUL

1903. Notes on the Herons of the District of Columbia. Smithsonian Miscel. Collections, Vol. 45, pp. 104-111.

BENT, ARTHUR C.

1919. Life Histories of North American Diving Birds. U. S. Nat. Mus., Bull. 107, pp. 1-245.
1921. Life Histories of North American Gulls and Terns. U. S. Nat. Mus., Bull. 113, pp. 1-345.
1923. Life Histories of North American Wild Fowl. U. S. Nat. Mus., Bull. 126, pp. 1-250.

BLANCHAN, NELTJE

1898. Birds that Hunt and are Hunted. Pp. 1-359. New York.

BOYD, GEORGE R.

1924. Drainage District Assessments. U. S. Dept. Agri.,
Dept. Bull. 1207, pp. 1-70.

BRAISLIN, WM. C.

1906. The Florida Gallinule Nesting on Long Island, New
York. *The Auk*, Vol. 23, pp. 189-194.

BREWSTER, WILLIAM

1891. A Study of Florida Gallinules, with Some Notes on a
Nest Found at Cambridge, Massachusetts. *The Auk*,
Vol. 8, pp. 1-7.
1903. Voices of a New England Marsh. *Bird-Lore*, Vol. 4,
pp. 43-56.
1906. The Birds of the Cambridge Region of Massachusetts.
Memoirs Nuttall Ornithol. Club, 4, pp. 1-426.

BROWN, R. A.

1906. A Study of the Birds of the Overflow, East of Ann
Arbor, Michigan. Eighth Ann. Rept. Mich. Acad. of
Sciences, pp. 162-174.

BURTCH, VERDI

1901. The Birds of a Marsh. *Bird-Lore*, Vol. 3, pp. 129-131.
Observations made near Keuka Lake, New York.
1915. A Mysterious Bird of the Marsh. *Bird-Lore*, Vol. 17,
pp. 104-108.
Observations on the Bittern.
1917. The Great Blue Herons of Honeoye. *Bird-Lore*, Vol.
19, pp. 73-78.
1917a. Nesting of the Florida Gallinule. *The Auk*, Vol. 34,
pp. 319-321.
1917b. The Summer Life of the Virginia Rail. *Bird-Lore*,
Vol. 19, pp. 243-248.
1920. Notes on the Black-crowned Night Heron in Western
New York. *The Auk*, Vol. 37, pp. 449-450.

BUTLER, A. W.

1897. Notes on Indiana Heronries. *Proc. Indiana Acad. of
Science*, pp. 198-201.

CAHN, ALVIN R.

1915. Notes on a Captive Virginia Rail. *The Auk*, Vol. 32,
pp. 90-95.

CALIFORNIA STATE FISH AND GAME COMMISSION

1924. Demand for Restoration of Lower Klamath Lake as Wild Fowl Breeding Grounds. Calif. Fish and Game, Vol. 10, pp. 124-126.
1924a. Reaction Against Drainage Projects Continues. Calif. Fish and Game, Vol. 10, p. 127.
1924b. "Act in Haste and Repent at Leisure." Calif. Fish and Game, Vol. 10, p. 127.

CHAPIN, JAMES P.

1922. The Function of the Oesophagus in the Bitterns' Booming. The Auk, Vol. 39, pp. 196-202.

CHAPMAN, FRANK M.

1900. Bird Studies With a Camera. Pp. 1-218, New York.

DIXON, JOSEPH

1924. Nesting of the Wood Duck in California. The Condor, Vol. 26, pp. 41-66.

EATON, ELON H.

- 1910-14. Birds of New York. N. Y. State Mus. Memoir 12, Vol. 1, pp. 1-501, 1910; Vol. 2, pp. 1-719, 1914.

ELLIOTT, C. G.

1909. A Report Upon the Drainage of Agricultural Lands in the Kankakee River Valley, Indiana. U. S. Dept. Agri., Office of Exper. Stations, Cir. 80, pp. 1-23.

EVERMANN, BARTON W.

1902. The Feeding Habits of the Coot and Other Water Birds. The Osprey, Vol. 1 (New Series), pp. 57-64.

EVERMANN, B. W. and CLARK, H. W.

1915. The Snakes of the Lake Maxinkuckee Region. Proc. Indiana Acad. of Science (1914), pp. 337-348.

FORBUSH, EDWARD H.

1916. Game Birds, Wild-Fowl and Shore Birds. Pp. 1-636. Mass. State Board of Agri., Boston.
1918. Tenth Annual Report of the State Ornithologist, Pp. 1-27. Mass. State Board of Agri. Boston.
1922. Some Under-Water Activities of Certain Waterfowl. Mass. Dept. Agri., Bull. 8, pp. 1-49.

FUERTES, LOUIS A.

1907. The Glossy Ibis in Central New York. *The Auk*, Vol. 24, p. 338.

GRINNELL, JOSEPH and STORER, TRACY I.

1924. "The Interrelations of Living Things." *Animal life in the Yosemite*, pp. 36-39. Berkeley, Calif.
A discussion of the dependence of wild creatures on natural conditions.

GROSS, ALFRED O.

1923. The Black-Crowned Night Heron (*Nycticorax nycticorax naevius*) of Sandy Neck. *The Auk*, Vol. 40, pp. 1-30; 191-214.

HARDY, MANLY

1889. Additional Notes on the Bittern. *The Auk*, Vol. 6, pp. 187-188.

HUNT, RICHARD

1923. The Phonetics of Bird Sound. *The Condor*, Vol. 25, pp. 202-208.

HUNTINGTON, DWIGHT W.

1910. Our Wild Fowl and Waders. Pp. 1-207. New York.

JOHNSON, CHARLES E.

1925. The Muskrat in New York: Its Natural History and Economics. *Roosevelt Wild Life Bull.*, Vol. 3, No. 2, pp. 199-322.

KOPMAN, H. H.

1921. Wild Life Resources of Louisiana. Louisiana Dept. of Conserv., Bull. 10, pp. 1-164.

LEARNED, AGNES M.

1909. A Bittern Study. *Bird-Lore*, Vol. 10, pp. 106-108.

MCATEE, W. L.

1911. Three Important Wild Duck Foods. U. S. Dept. Agri., Biol. Survey, Cir. 81, pp. 1-19.
1914. Five Important Wild-Duck Foods. U. S. Dept. Agri., Bull. 58, pp. 1-19.
1915. Eleven Important Wild-Duck Foods. U. S. Dept. Agri., Bull. 205, pp. 1-25.

McATEE, W. L. and BEAL, F. E. L.

1912. Some Common Game, Aquatic and Rapacious Birds in Relation to Man. U. S. Dept. Agri., Farmers' Bull. 497, pp. 1-30.

McCRORY, S. H.

1919. The Drainage Movement in the United States. U. S. Dept. Agri. Yearbook for 1918, Sep. No. 781, pp. 1-10.

MICKLE, G. R.

1912. Possibilities of Northern Ontario as a Breeding Ground for Ducks. Pp. 1-8. Toronto.

MICKLE, G. R. and THOMSON, R. B.

1913. The Increase of the Food Supply for Ducks in Northern Ontario, With Descriptions of Edible Plants. Pp. 1-17. Toronto.

MILLER, RICHARD F.

1910. Notes on the Florida Gallinule (*Gallinula galleata*) in Philadelphia County, Pa. The Auk, Vol. 27, pp. 181-184.

MINNESOTA GAME AND FISH DEPARTMENT

1923. Muskrat Marshes Valuable. Fins, Feathers and Fur, No. 33, p. 66.
1923a. What Game Wardens Think of Unwise Drainage. Fins, Feathers and Fur, No. 33, p. 77.

MORRIS, F. O.

1891. A History of British Birds. 3rd ed.; Vol. 5, p. 61.

NELSON, E. W.

1920. Conservation of Inland Lakes and Marshes as a Valuable Public Asset. Minn. Game and Fish Dept., Fins, Feathers and Fur, No. 22, pp. 5-6.
1924. Unwise Drainage. Bull. Amer. Game Protec. Assoc., Vol. 13, pp. 8-9, 11.
1924a. Klamath Lake Bird Reservation Past and Present. Calif. Fish and Game, Vol. 10, pp. 126-127.

OBERHOLSER, HARRY C.

1923. The Winneshiek Bottoms Drainage Project. Minn. Game and Fish Dept., Fins, Feathers and Fur, No. 34, p. 85.

PEARSON, T. GILBERT

1913. The Green Heron. *Bird-Lore*, Vol. 15, pp. 198-201.
(Nat. Assoc. Audubon Soc., Educational Leaflet No. 66.)
1919. Least Bittern. *Bird-Lore*, Vol. 21, pp. 198-201. (Nat. Assoc. Audubon Soc., Educational Leaflet No. 98.)

PEET, MAX MINOR

1908. An Ecological Study of the Birds of the Ypsilanti Bayou.
Tenth Ann. Rept. Mich. Acad. Sciences, pp. 162-196.

REED, HUGH D. AND WRIGHT, ALBERT H.

1909. The Vertebrates of the Cayuga Lake Basin. *N. Y. Proc. Amer. Philos. Soc.*, Vol. 48, pp. 370-459.

REDFIELD, ALFRED C.

1911. Photographing the Virginia Rail. *Bird-Lore*, Vol. 13, pp. 285-287.

REYWAL, A. G.

1921. Unwise Drainage a Public Menace. *Bull. Amer. Game Protec. Assoc.*, Vol. 10, No. 4, pp. 6-8.

ROBERTS, THOMAS S.

1918. The Water Birds of Minnesota; Past and Present.
Bien. Rept. State Game and Fish Comm. of Minn. for
Period ending July 31, 1918, pp. 56-91.

SAUNDERS, ARETAS A.

1915. Suggestions for Better Methods of Recording and
Studying Bird Songs. *The Auk*, Vol. 33, pp. 173-183.
1922. A Question Concerning the Distribution of the Long-
billed Marsh Wren. *The Auk*, Vol. 39, p. 267.

SILLOWAY, P. M.

1897. "River-Bank and Swamp-Lake." *Some Common Birds*,
pp. 287-331. Cincinnati.

SURBER, THADDEUS

1923. What We Have Learned From a Scientific Investiga-
tion of Our Streams and Lakes and Its Bearing on
Drainage. *Fins, Feathers and Fur* (Minn. Game
and Fish Dept.) No. 35, pp. 107-110.

TABOR, E. G.

- 1899. A Least Bittern Portrait. *Bird-Lore*, Vol. 1, pp. 39-40.
(Photographed at Otter Lake, New York.)
- 1905. The American Bittern at Home. *Bird-Lore*, Vol. 7,
pp. 165-168. (Photographed near Meridian, New
York.)

TORREY, BRADFORD

- 1889. The 'Booming' of the Bittern. *The Auk*, Vol. 6, pp.
1-8.
- 1899. Watching the Bittern Pump. *Bird-Lore*, Vol. 1, pp.
123-125.

TOWNSEND, CHARLES WENDELL

- 1905. The Birds of Essex County, Massachusetts. *Memoirs
Nuttall Ornithol. Club*, No. 3, pp. 1-352.

WEBER, J. A.

- 1909. The Virginia and Sora Rails Nesting in New York City.
The Auk, Vol. 26, pp. 19-22.

WETMORE, ALEXANDER

- 1924. Food and Economic Relations of North American
Grebes. *U. S. Dept. Agri., Bull.* 1196, pp. 1-23.

WILLARD, E. V.

- 1924. Drainage Development in its Relation to Wild Animal
and Plant Life and Rainfall. *Bull. Minn. Federation
of Achitectural and Engineering Societies*, pp. 2-12.

WRIGHT, J. O.

- 1907. Swamps and Overflowed Lands in the United States;
Ownership and Reclamation. *U. S. Dept. Agri., Of-
fice Exper. Stations, Cir.* 76, pp. 1-23.

PLATE 8. BLACK TERN

- | | |
|---|---|
| 1: In flight. | 6: Flight, front view (at top of wing beat). |
| 2: Hovering. | 7: Young Tern watching parent approach with food. |
| 3: Young bird, sitting on ground. | 8: Adult dropping food. |
| 4: Adult, perching. | 9: Young receiving food. |
| 5: Flight, front view (at bottom of wing beat). | |

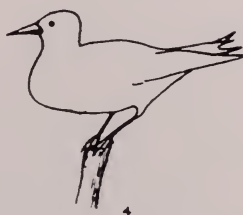
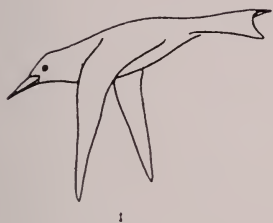


PLATE 9. BLACK DUCK

- | | |
|---|------------------------------|
| 1: Swimming. | 8: Feeding by tipping up. |
| 2: Feeding by scooping surface, in shallow water. | 9: Preening back. |
| 3: Swan pose. | 10: Scratching ear. |
| 4: Alert and watchful. | 11: Preening side feathers. |
| 5: Feeding pose. | 12: Preening breast. |
| 6: Wading in shallow water. | 13, 14: End of a quarrel. |
| 7: Feeding by immersing bill. | 15: Asleep—with an eye open. |

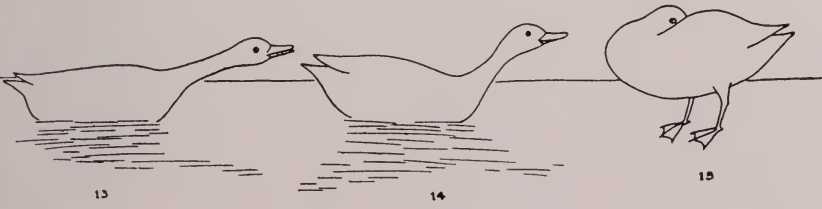
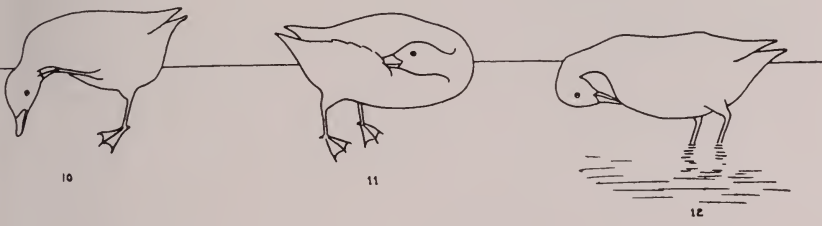
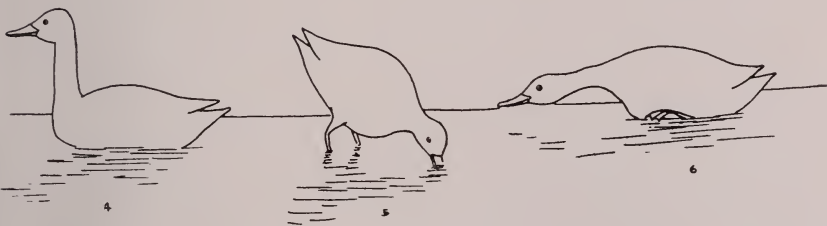
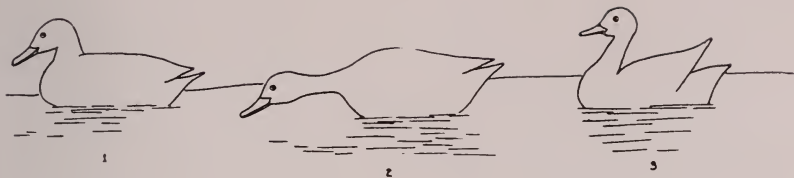


PLATE 10. WOOD DUCK

- | | |
|---------------------------------------|----------------------------------|
| 1, 2: Poses while feeding on surface. | 7: Swan pose. |
| 3: A mother with downy young. | 8: Asleep, front view. |
| 4: Feeding. | 9: Resting, side view. |
| 5: Front view, perching on a stump. | 10: In flight. |
| 6: Swimming fast in weedy water. | 11: Dropping to alight in water. |
| | 12: A drake, resting. |

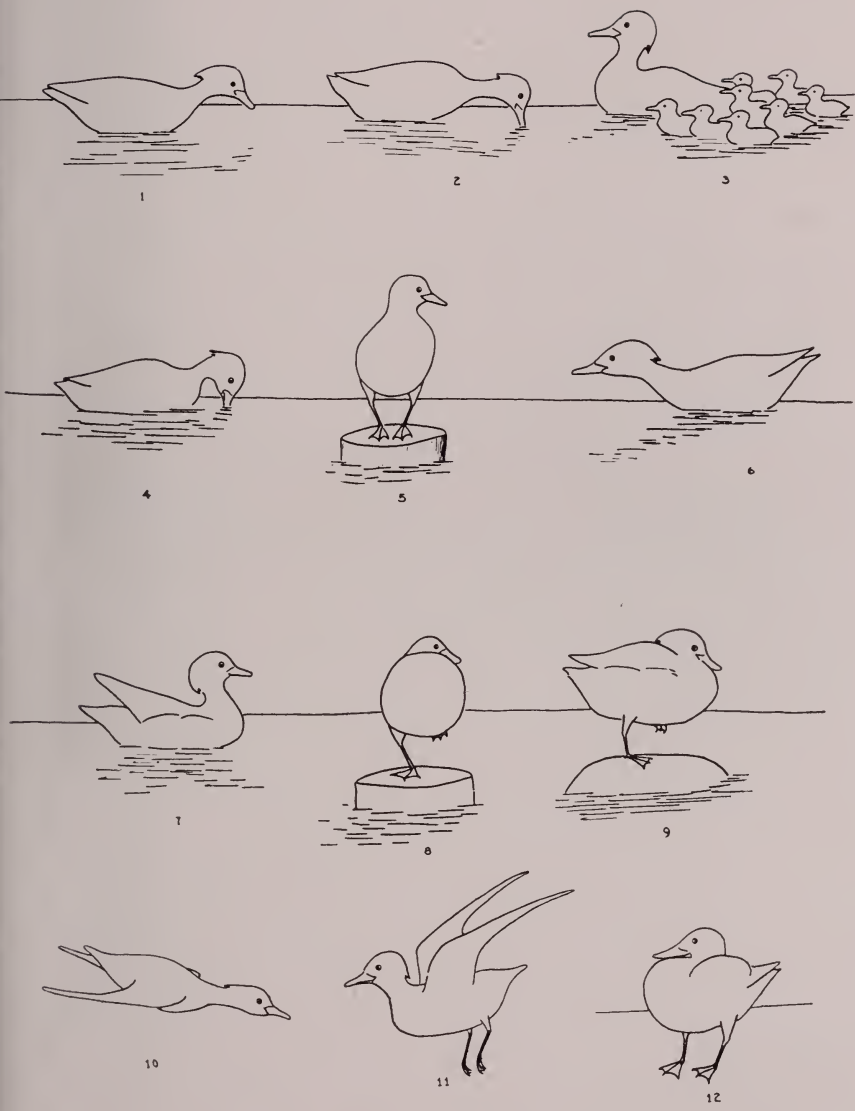


PLATE 11. AMERICAN BITTERN

- | | |
|-------------------------|-------------------------------|
| 1: Characteristic pose. | 5: Fishing in shallow water. |
| 2: Adult and young. | 6: Running through cat-tails. |
| 3: Beginning fishing. | 7: Perching in cat-tails. |
| 4: Fishing pose. | 8: Attracted by a noise. |

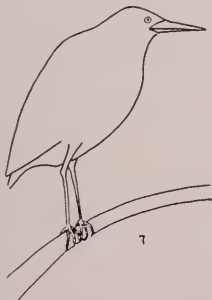
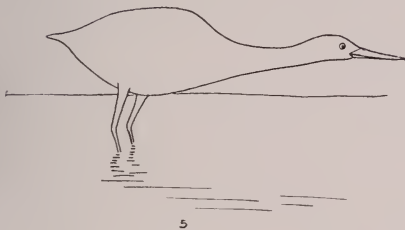
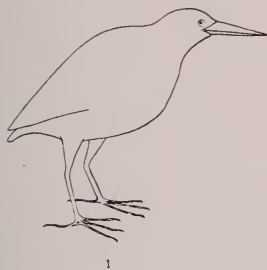
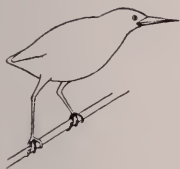


PLATE 12. LEAST BITTERN

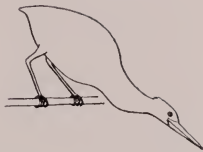
- | | |
|--|---|
| 1: Approaching a fishing place. | 6: Walking down a cat-tail stalk,
toeing in. |
| 2: Beginning fishing. | 7: Another fishing pose. |
| 3: Getting more interested. | 8: Stalking over the cat-tails. |
| 4: Straight-line pose, just before
catching a fish. | 9: Attracted by some noise. |
| 5: Leaving the fishing ground, back
view. | |



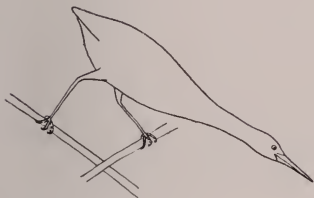
1



2



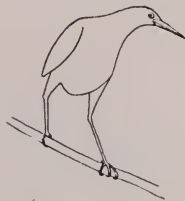
3



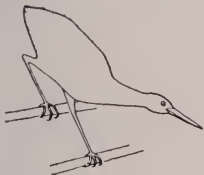
4



5



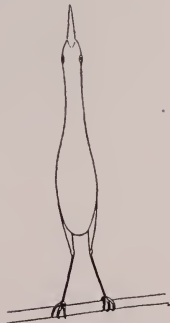
6



7



8



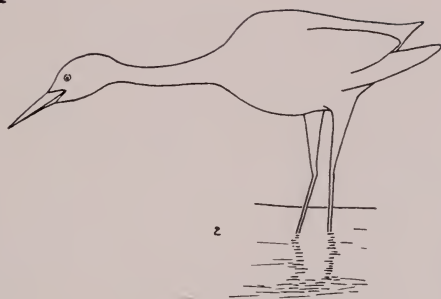
9

PLATE 13. GREAT BLUE HERON

- | | |
|--|-----------------------------------|
| 1: Perching. | 6: Young Heron with a bullhead. |
| 2, 3: Fishing poses. | 7: Normal flight. |
| 4: About to alight. | 8: Flight with outstretched neck. |
| 5: Resenting approach of bird in 4
above. | |



1



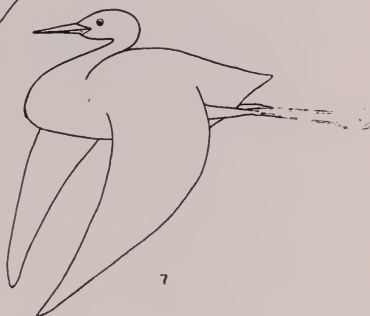
2



3



4



7



5



6



8

PLATE 14. GREEN HERON AND NIGHT HERON

Green Heron

- 1: Perching.
- 2: Climbing.
- 3: Disturbed by a muskrat.
- 4: Another perching pose.
- 5, 6: Fishing poses.

Night Heron

- 7, 8: Perching.
- 9: Flight.
- 10: Wading.
- 11, 12: Fishing poses.



1



2



3



4



5



6



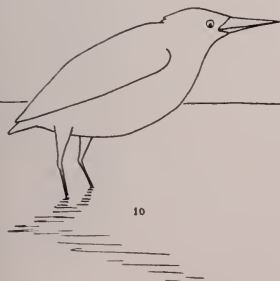
7



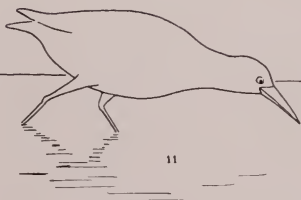
8



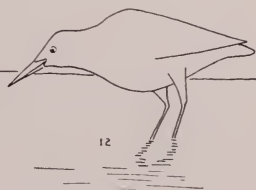
9



10



11



12

PLATE 15. VIRGINIA AND SORA RAILS

Virginia Rail

- 1: Searching for food.
- 2: Front view.
- 3: Running.
- 4, 5: Probing.
- 6: Walking.
- 7: Feeding in foliage overhead.
- 8: Preening breast.
- 9: Sitting down to rest.

Sora

- 10: Searching for food.
- 11: Front view,—“thin as a rail.”
- 12: A feeding pose.
- 13: Swimming.
- 14: Walking, front view.
- 15: Frightened, running to shelter.

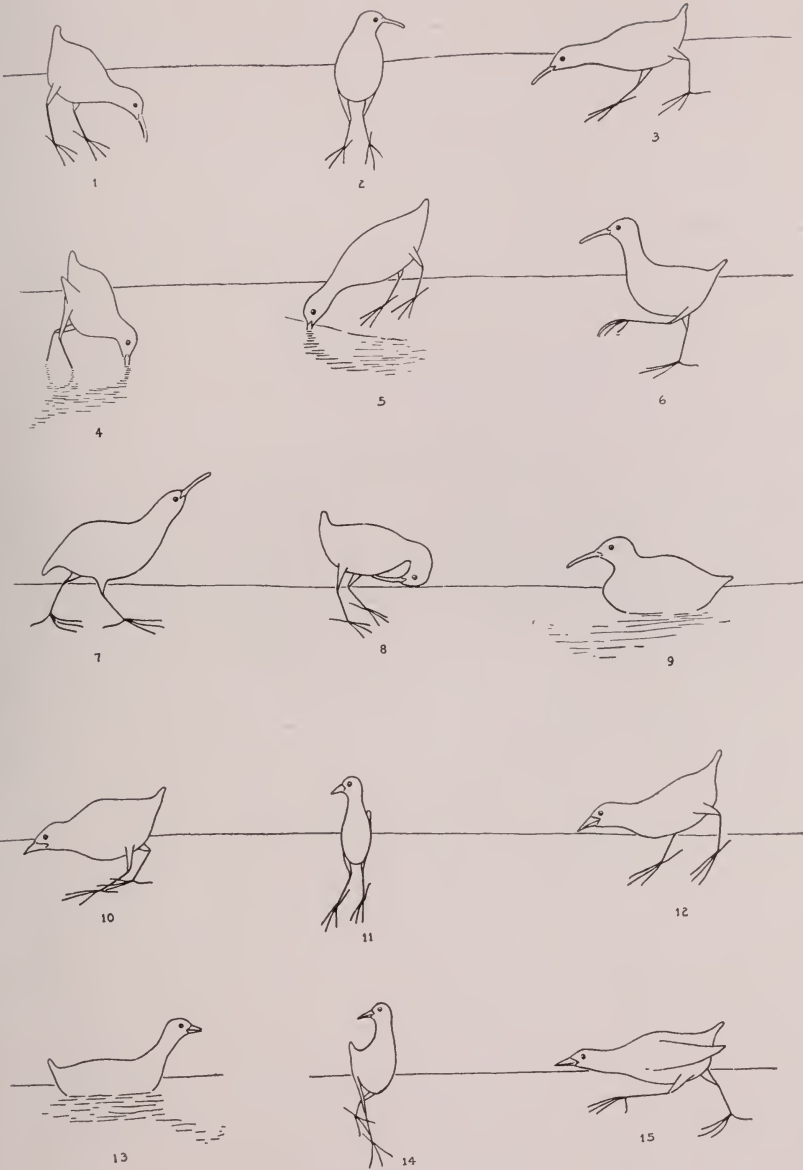


PLATE 16. FLORIDA GALLINULE

- | | |
|------------------------------------|----------------------------------|
| 1: Watching the water. | 9: Swimming. |
| 2: Running. | 10: Swimming in thick weeds. |
| 3: Fishing like a Bittern. | 11: Swimming with feet appearing |
| 4: Another running attitude. | above water. |
| 5: Removing water weeds from foot. | 12, 13: Feeding on duckweed. |
| 6: Standing at edge of cat-tails. | 14: Parent about to feed downy |
| 7: Wading, rear view. | young. |
| 8: Wading and feeding. | 15: Another feeding pose. |

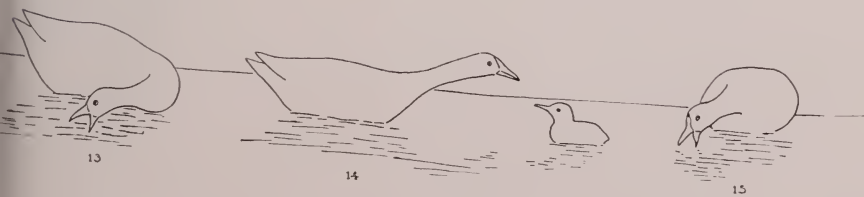
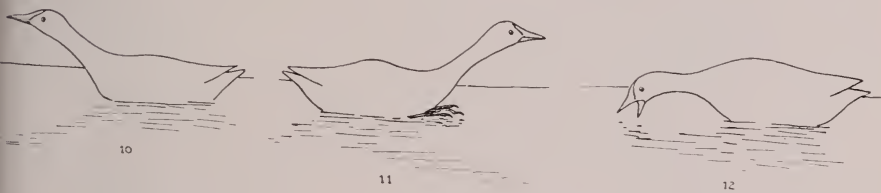
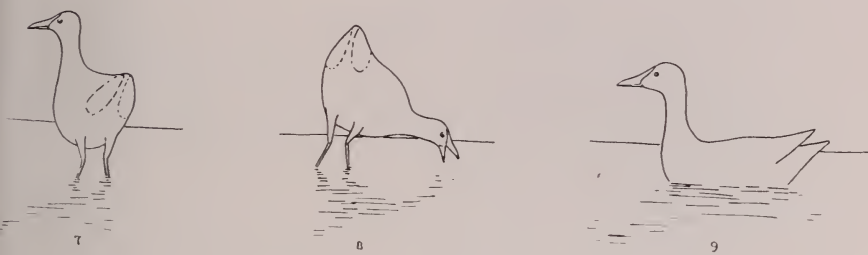
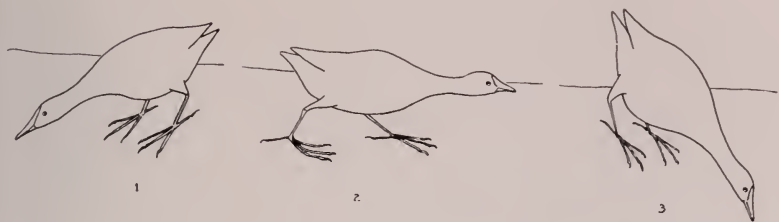
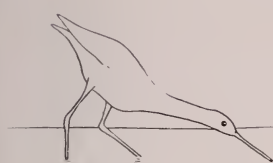


PLATE 17. YELLOW-LEGS

- | | |
|---|---|
| 1, 2: Feeding. | 7, 8: Another fighting pose. |
| 3: Bathing. | 9: Preening back. |
| 4, 5: Two Yellow-legs in fighting attitude. | 10, 11: End of a fight,—the crouching bird admits defeat. |
| 6: Preening breast. | 12: Scratching chin. |



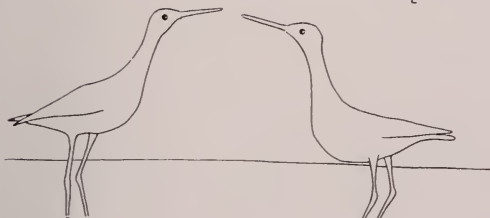
1



2



3



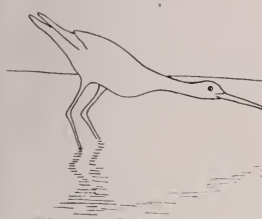
4



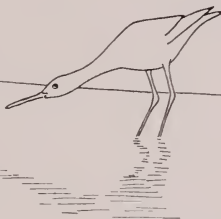
5



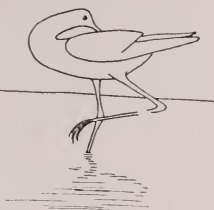
6



7



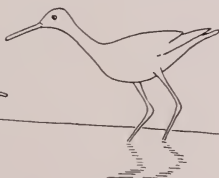
8



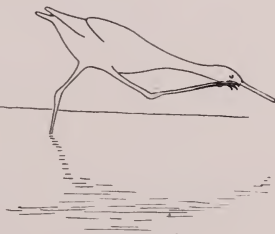
9



10



11



12

PLATE 18. SHORE BIRDS

Wilson's Snipe

- 1: Walking.
- 2: Probing.
- 3: Displaying.

Pectoral Sandpiper

- 4: A normal pose.

Least Sandpiper

- 5, 6, 7: Characteristic attitudes.

Spotted Sandpiper

- 8, 9: Two birds in fighting attitudes.

Killdeer

- 10, 11: Feeding.
- 12: Displaying.
- 13: Bathing.



1



2



3



4



5



6



7



8



9



10



11



12



13

PLATE 19. GREBE, KINGFISHER AND TEAL

Pied-billed Grebe

- 1: Swimming.
- 2: Alert.
- 3: Preening.
- 4, 5: Surface feeding.
- 6: Rear view.

Belted Kingfisher

- 7: Watching the water.
- 8: Holding a fish crosswise.
- 9: With a sunfish too large to swallow.

Blue-winged Teal

- 10: Swimming.
- 11: Preening.
- 12: Feeding.



1



2



3



4



5



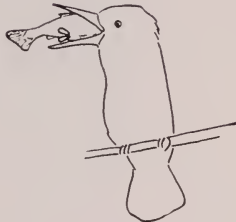
6



7



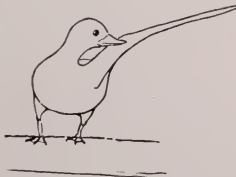
8



9



10



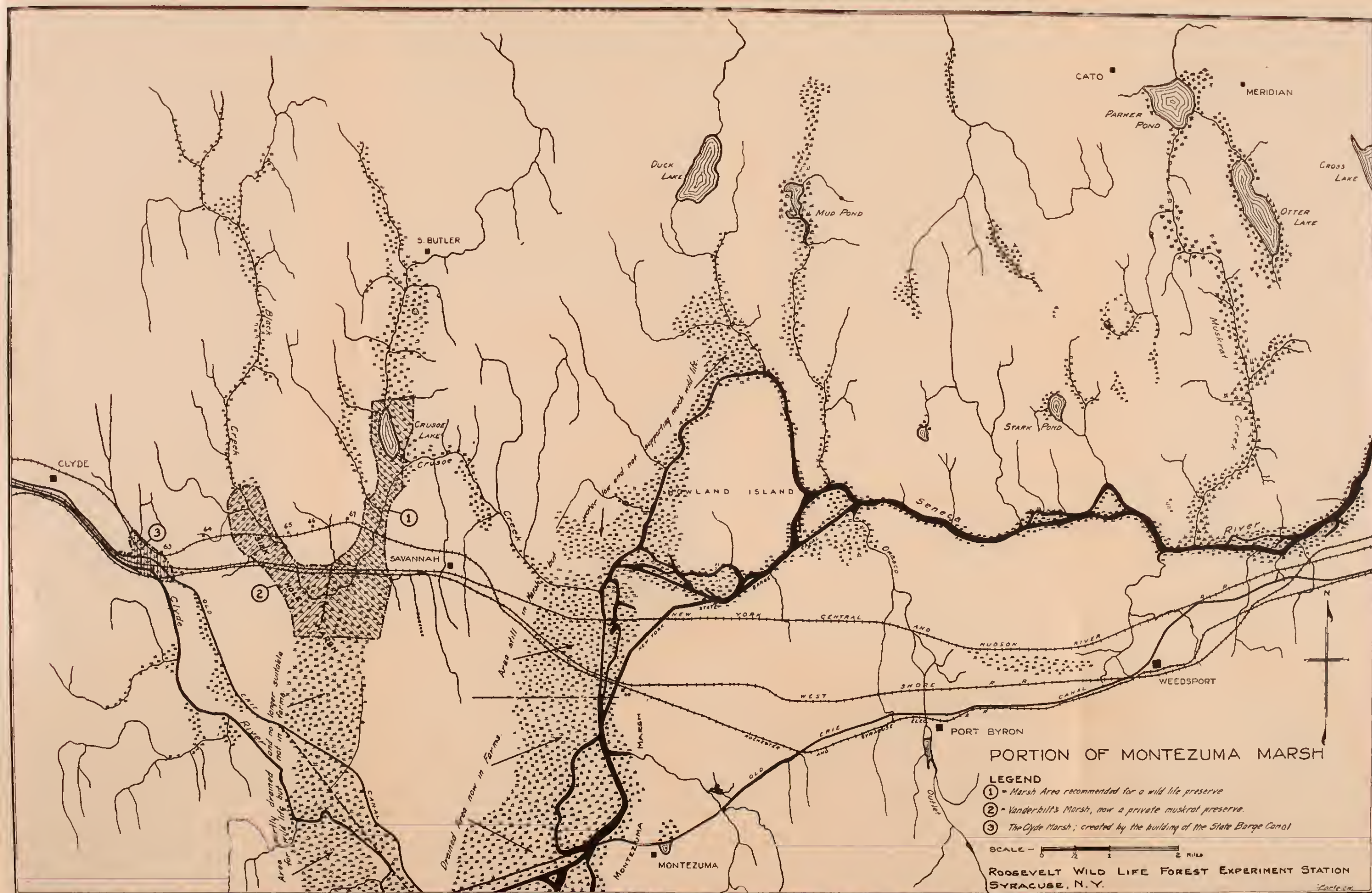
11



12



Fig. 146. View down Quaker Run Valley from second clearing at the Lookout, Allegany State Park, August 29, 1922.



Map 6. The Sink Hole section of Montezuma Marsh, and adjacent marsh and swamp lands, showing area recommended for a wild life preserve. (Based on Clyde and Weedsport quadrangles of U. S. Geological Survey topographic atlas, with corrections in location of certain swamp and marsh areas.)

ADDITIONAL NOTES ON THE SUMMER BIRDS OF
ALLEGANY STATE PARK

BY ARETAS A. SAUNDERS

*Roosevelt Field Ornithologist, Roosevelt Wild Life Forest
Experiment Station, Syracuse, N. Y.*

CONTENTS

	PAGE
1. Introductory Note	477
2. General Notes on the Summer Birds.....	478
3. The Cessation and Revival of Song in Late Summer....	486
4. Suggestions on Bird Preserves in the Allegany State Park	491
5. Summary and Conclusions.....	495
6. List of References.....	496

INTRODUCTORY NOTE

A report of the birds found in summer in the Allegany Park in Southwestern New York has already appeared in the Roosevelt Wild Life Bulletin (Saunders, '23). This report was mainly the result of field work done in the summer of 1921. In the month of August, 1922, further studies of the birds of this region were made. Only one species was added to the list of those found in 1921, and this one, the Brown Creeper, could fortunately be added to the original list before it appeared in print. Other observations of 1922, while not adding new species, included a number of facts concerning those species already known to occur in the region, that are of some interest, and that furnish the basis for this report.

It was intended to spend as much time as possible in 1922 on a study of the two breeding game birds, the Woodcock and the Ruffed Grouse. August, however, is a poor month in which to learn much about these birds; notes on them are therefore rather meager. Such game birds deserve a complete field study that would include their activities in every month of the year.

In 1922 a headquarters from which to work was established at the camp of the Buffalo Society of Natural Sciences on Quaker Run. This location, while farther into the heart of the Park area than that chosen in 1921, gave actually less variety in the country that was nearby and easily visited (see Figs. 146, 147). Observations

in 1922 included mainly forest birds. Birds of the meadows, thickets, orchards, and the more open country near the Park boundary were not observed to so large an extent as in the preceding year.

In connection with these studies I here wish to acknowledge my indebtedness to the Commissioners of the Allegany State Park, and to the officials of the Buffalo Society of Natural Sciences, for their financial and other hearty cooperation with the Roosevelt Wild Life Station, and for facilitating my two seasons' work in the Park.

GENERAL NOTES ON THE SUMMER BIRDS

GREAT BLUE HERON. *Ardea herodias herodias* Linnaeus

In 1921 this species was not observed in the Park area, though it occurred a short distance outside the boundaries. It is therefore worth while to record the fact that it was seen this year in the Park itself. A single bird was noted on Quaker Run above the Buffalo Camp on August 11. Others were noted in the same locality August 13 and 22.

WOODCOCK. *Rubicola minor* (Gmelin)

This species was seen more frequently in 1922 than 1921. Several birds fed in the vicinity of the Buffalo Camp nearly every evening, and could usually be found by a little search. Search for borings of this species in places where they fed failed to reveal anything. A general examination of feeding grounds showed that the birds fed in the soft, moist humus that covered the forest floor, and that this material was such that where the birds probed for food no impression was left when the bill was withdrawn. Attempts were made to watch this species feeding, by going to a favorable spot and waiting for them to appear in the early evening. These attempts failed, however, and it was evident that the birds could feed almost anywhere in such a forest and in such moist weather as prevailed that summer, and that waiting at favorable spots would not be likely to produce results.

Practically all observations of Woodcock were made in the evening. Once or twice birds were seen early in the morning, but they were not seen in their feeding places in the middle of the day. One day, August 23, when tramping through an area of oak-chestnut forest near the Park boundary, I came upon two birds of this species on a high, dry ridge, among the oak leaves of the forest floor. This was the only time I saw them during the middle of the day, and I am

inclined to think that it was in such places that the birds spent the day, though why they should not spend the day as well as the night in the places where they fed is not clear.

RUFFED GROUSE. *Bonasa umbellus* (Linnaeus)

As previously noted the Ruffed Grouse is quite common in this region. An attempt was made to study something of their habits at this time of year, but it was not particularly successful. No broods of small young were seen as they were the previous year in July. A few broods of half-grown young were met with, but most birds seen were single birds or birds in groups of two or three in which no one bird could be distinguished as the parent, and if the remainder were young of the year they were now full grown.

Attempts to study the habits of these birds were not particularly successful. Birds were seen mainly by walking through areas where they were and flushing them from the ground or low bushes where they had been feeding. It was almost impossible to see a bird before it was aware of one's approach. Once the birds were on their guard they would not behave naturally, and would fly off sooner or later. Following birds that had been flushed and gone on to another point only resulted in flushing them again, for the underbrush where they lived was too thick to see them from any distance or to approach them without making considerable noise. Waiting for these birds to appear in a particular feeding spot was also practically useless, for feeding spots were abundant, and birds were not likely to be found in the same place two days in succession.

The main thing that was observed concerning this species in the month of August was that the food was chiefly berries at that time. In most cases the birds were found in thickets of blackberry or raspberry bushes (Fig. 148). Both the wild red raspberry (Fig. 149) and blackberries (Fig. 150) were common in many places. There was evidently an abundance of food of this sort for the grouse. The majority of red raspberries were evidently ripe earlier in the year, but observation showed that some ripe berries were still to be found after the middle of August, while the blackberries at that season were in their prime. Figures 151 and 152 show typical grouse habitats.

RED-TAILED HAWK. *Buteo borealis borealis* (Gmelin)

This hawk was much less abundant in 1922 than in 1921. A few were seen, but the contrast in the two years is obvious when I compare daily records. Out of forty-four days in the Park region in

1921, this species was seen on fifteen of them. During twenty-nine days in 1922 this species was seen only twice.

The reason for this decrease is also obvious. Someone in control of the Park, supposing hawks to be always harmful and detrimental to the good of the Park, paid a bounty to the newly employed Park rangers for the destruction of hawks. No distinctions were made as to species, and the Red-tail, being the largest, most abundant, and most easily killed species, was the one to suffer. The establishment of a State Park in which wild life is supposed to be left undisturbed does not always protect the wild life there. In this case it nearly exterminated, so far as the Park area was concerned, a beautiful, magnificent, and useful species in the short period of a single year. Although it is many years since the usefulness of this species was established through a study of its food habits (Fisher, '93, pp. 48-62), it will apparently be many more before that fact becomes known to any but the enlightened few, and before a hawk will cease to be vermin merely because it is a hawk. This fact points out the need, in the management of State Parks and other areas of similar purpose, of competent authority in the control and treatment of wild life; of some one who knows simple facts and is free from popular prejudices. Authorities might have done less harm by establishing a bounty on some common small bird, the Chickadee, for instance. Though such an idea would be instantly atrocious to all bird lovers, it would actually do less harm, for the Chickadee is too abundant to be destroyed immediately, and a year's time would not so nearly commit that crime of crimes, the extermination of a species.

SHARP-SHINNED HAWK. *Accipiter velox* (Wilson)

This hawk was observed frequently in the Park in 1922, whereas only a single bird was seen once in 1921. Evidently this species had increased in the area. This smaller hawk, being swifter in flight, and less given to soaring or perching in the open and more to skulking in thickets, had not suffered as had the Red-Tail. Perhaps the reason for its increase is to be found in the question of territory (cf. Howard, '20, pp. 215-258). With the Red-tail that had formerly occupied most of the territory gone, this smaller species found room to live and came into the area in greater numbers.

If these are the facts, then a general attempt to destroy all hawks results in upsetting the balance of nature in favor of the smaller, more harmful species (cf. Fisher, '93, pp. 32-37). On the other hand, even the Sharp-shinned Hawk is a wild bird, a species that



Fig. 147. View northeast from first clearing at the Lookout, south of Quaker Run and headquarters. August 28, 1922.



Fig. 148. A thicket of blackberry and raspberry bushes on the border of the forest; a late summer habitat of the Ruffed Grouse. August 26, 1922.

true bird lovers would not wish to see exterminated. In many places it has been the object of special destruction; in many bird "sanctuaries" it has been hunted and exterminated. In such an area as a State Park, it ought to be preserved with all other forms of wild life. A State Park should be not merely a songbird sanctuary or a game bird sanctuary, but a *bird* sanctuary, and the Sharp-shinned Hawk is as much a bird as the rest.

SCREECH OWL. *Otus asio asio* (Linnaeus)

This is another species that was noted more frequently in 1922 than in 1921. The reason in this case was probably due not to any increase of the species, but only to the fact that headquarters were located where I could hear the birds at night. It may also be partly due to the later season, for I have noted that this owl calls most frequently in late summer and fall. It was first heard the night of arrival in camp, July 31, and again August 8, and after that date almost every night until the end of my stay in the Park, Aug. 30.

There seems to be a curious fact concerning the Screech Owl that is not accounted for in its life history. This is the fact that it calls, or sings—if its wavering cry is properly a song—more commonly in late summer and fall after the nesting is over, and less commonly in spring or early summer. At least, this has been my experience. In records kept for a number of years I have numerous August, September and October records of its call, a few July ones, one in June, but none in May or April. I have one at least for December. Perhaps this is merely chance, and the bird does call frequently in spring, but I have not been fortunate enough to hear it (cf. Bicknell, '85, pp. 260-261; Bowles, '06, p. 143).

NIGHTHAWK. *Chordeiles virginianus virginianus* (Gmelin)

On August 23 a flight of Nighthawks was observed that was interesting. The migration of this species probably begins in late August. In the early afternoon of this day a thunderstorm was approaching from the west. The storm however was slow in coming, and threatening clouds, distant rolling of thunder, and wind, continued for some time before the rain finally arrived. During this period a flock of thirty-three Nighthawks flew east ahead of the storm. A little later twelve birds came back westward again; and then, after a short period, another larger flock of sixty-four followed the first flock east. Nothing more than this was observed, but I rather suspected that the birds were following insects driven

before the storm, for they did not seem to be trying to get away from the storm itself. The birds were too high up to observe whether they caught insects as they flew or not.

SLATE-COLORED JUNCO. *Junco hiemalis hiemalis* (Linnaeus)

A nest of this species was located in the midst of the Buffalo Camp, and was under constant observation by a number of people. The nest contained eggs on our arrival, July 31, and the eggs hatched August 9. There seem to be few descriptions of the young of passerine birds, or of the development of their plumage. These young birds when first hatched were typical of a large majority of young passerine birds, having flesh-colored skin, and dark bluish color about the eyes and at the tips of the wings. The upper parts were clothed with a dark gray down, but there was no down on the lower parts, nor on the tail where some young passerine birds have more or less down. The lining of the mouths was deep pink and the swollen edges of the mouths were pale yellow.

When three days old, on August 12, these birds presented a very similar appearance though they were much larger, fully three times as large, to judge by appearances. At the tips of the wings the sheathed primary feathers were beginning to push through, and on the tail appeared a coarse, white down, distinctly different in appearance from the gray down of the other feather tracts. On August 14, when the young were five days old, they showed a great change in appearance. The eyes were beginning to open, and feathers were coming through on all the feather tracts. All those of the upper parts appeared to be blackish, while those of the throat, breast, lower parts and tail appeared yellowish white.

On August 15 the feathers of the upper parts were unsheathing rapidly and the birds appeared pretty well feathered. They still possessed no sense of fear when handled. August 16 and 17 the feathers continued to come out further and to break further and further through the sheaths, but the sense of fear was still undeveloped. On the 18th the birds appeared to possess this sense of fear and I dared not attempt to handle them as I wished to keep them in the nest as long as possible. They left the nest on the morning of the 19th when ten days old, and shortly after this they were not to be found about the camp.

SONG SPARROW. *Melospiza melodia melodia* (Wilson)

On August 15 Mr. B. A. Sarecky brought me an egg that was evidently of a bird of this species. It was found on the top of a moss-covered log and not in a nest. It is probably an instance of

egg-laying at about the time that the approach of fall moult would cause the nesting instincts to slacken. Such occurrences are probably quite common, but the evidences of them are not likely to be found often.

CEDAR WAXWING. *Bombycilla cedrorum* Vieillot

This species seemed more abundant than in 1921, and evidently had nested abundantly about the Buffalo Camp in late July. Some occupied nests were found in August, and numerous empty nests that appeared to belong to this species were discovered. While one cannot definitely identify an empty nest, I have found that a characteristic of empty nests of this species when they have contained young birds is stones of wild cherries in the bottom. This would not be true, of course, in a region where some other wild fruit is the chief food.

In this region the chief food is evidently the fruit of the pin cherry or fire cherry (*Prunus pennsylvanica*). Members of the Buffalo Society of Natural Sciences who had watched the nesting earlier in the year reported that the birds also fed the young on service berries (*Amelanchier*). Evidently the chief season of nesting in the Park is late July, so that the young are fed then or in early August. This corresponds with the season of ripening of the fire cherry. In contrast to this in southern Connecticut, where the fire cherry is unknown and the chief food is the wild black cherry (*Prunus scrotina*), nesting usually comes later, the young being fed in late August and early September when the black cherries are ripe (Saunders, '11, p. 327).

BLACK-THROATED GREEN WARBLER. *Dendroica virens* (Gmelin)

A characteristic of late summer in the wooded areas of the Alleghany Park is the notes of young warblers. These sounds are heard continually in the tops of the trees, the birds often being too high up to distinguish their species. When the species are distinguished, they usually prove to be either Magnolia or Black-throated Green Warblers. I found myself unable to make out any difference between the calls of the young of these two species. The voices appeared to be identical and the sound is probably one that is ancestral to the genus *Dendroica*.

On August 18 I watched for a considerable time a male of this species followed by two young that were not long out of the nest. The birds were in willows and other shrubs on the border of Quaker Run. Whenever the male bird found insect food among the wil-

lows the young warblers flew to him and begged for it with the notes I have mentioned above, and with wings quivering with excitement. The male generally fed the one nearest, and then flew to another willow, soon followed by the two young. Once or twice the male found an insect when the young were not watching him, and then he ate it himself. But if the young saw him with an insect he seemed unable to resist their appeals, though they were apparently perfectly able to find food for themselves.

LOUISIANA WATER-THRUSH. *Sciurus motacilla* (Vieillot)

In 1921 this species was not found actually within the park boundaries, the only bird noted being at Salamanca. It is worth while therefore to record that in 1922 a bird of this species was seen along Quaker Run on August 3. This bird was probably not one that nested in the Park but a bird on fall migration, for the migration of the species takes place surprisingly early, and August 3 is actually rather a late date on which to observe it.

CHICKADEE. *Penthestes atricapillus atricapillus* (Linnaeus)

Chickadees were reasonably common in the Quaker Run valley and in other parts of the Park visited. A point that does not seem to have been brought out concerning this well-known bird is the frequency with which it sings in late summer, if the so-called "phoebe" whistle is to be considered its song. In my experience this song is likely to be sung in almost any month of the year, but in late July and August, a period when other bird songs have ceased, it is particularly common. In Allegany Park in 1922 this fact was quite noticeable.

There seems to be a certain amount of mystery about this song of the Chickadee. Not only is it sung in almost every month, but in my experience it will attract Chickadees at any time. It is well known that the birds respond quickly to an imitation of the note. Perhaps it is not so well known that this is true at all seasons of the year. The birds will often not reply to the whistle, but if within hearing they never fail to come, and a rule as to what seasons they will or will not reply in, is difficult to make. It seems always true, however, that Chickadees will both approach and reply to the imitation call in late summer more readily than at any other time of year.

It was noticeable that these singing birds in August were strongly tinged with buff along the sides, a mark of the fresh plumage, and a sign that not only the breeding season, but also the post-nuptial moult was over. The song at this time has no mating significance. Perhaps its purpose at this season is to call the birds together in

flocks for the fall and winter, and yet with the abundance of other notes this would hardly seem necessary. However it is, the curious fact of late summer singing presents a problem of bird song that deserves attention.

THE CESSATION AND REVIVAL OF SONG IN LATE SUMMER

This subject is one that can be best pursued in the month of August and about which only a little has been published (cf. Bicknell, '84-'85; Fry, '16). It is easy to note the dates when birds begin singing in the spring, but it is more difficult to get the dates when they cease to sing in late summer, and when our ears have become so accustomed to the songs that we do not note them frequently. We suddenly become conscious one day in mid-August that a certain bird is not any longer heard. When it ceased to sing we do not feel quite sure. I have found that the only way to overcome this difficulty is to go into the field in August with the special desire to note how many species are singing and to what extent. Doing this and keeping daily records of the species in song is the only method that brings results. But even then I have sometimes felt that my notes may not be as accurate as they should be, owing to the fact that one may become so accustomed to a simple, monotonous bird song as to be unaware that the bird is singing.

Where I can do so, I have entered here notes on this subject both for 1921 and 1922, but the difference in the time spent in the Park in each year, and the difference in locality, make results not comparable in many cases. Some species cease singing in July. These are noted only in the 1921 dates. Some species continue until sometime in the latter part of August, and these are noted only in the 1922 dates. Species on which notes were made, with the dates on which the last songs were heard, are as follows:

Yellow-billed Cuckoo. Aug. 6, 1921; Aug. 3, 1922.

Black-billed Cuckoo. Aug. 4, 1921; Aug. 2, 1922.

Flicker. (The long call, "wick wick wick" etc., is considered to be the song.) Aug. 6, 1921; Aug. 1, 1922.

Whip-poor-will. July 21, 1921.

Phoebe. July 16, 1921. This species was heard only irregularly in the first part of July, though it was common enough to have been heard daily had the species been in full song.

Wood Pewee. This species was heard practically daily until July 17, and then again July 23, 25, and August 6, 7 and 14 in 1921.



Fig. 149. Red raspberries, a late summer food of the Ruffed Grouse. August 17, 1922.



Fig. 150. Blackberries, a favorite late summer food of the Ruffed Grouse. August 17, 1922.

In 1922 it was heard July 31 and August 1, and regularly between August 15 and 22. It is difficult to make much out of such dates, but I believe the period of cessation of song in this species comes in late July or early August; and that either because it is short in duration or because individuals vary greatly in the time of its coming, the bird is one that has been credited with late singing, and is frequently heard in late August.

Red-Winged Blackbird. July 27, 1921.

Meadowlark. Aug. 9, 1921. The location was such that I was unable to hear this species in 1922.

Baltimore Oriole. Heard regularly until July 4 in 1921. Songs heard later, on July 10, 11, 16, 22, Aug. 9 and 13. In 1922 we were unable to hear this species. Most ornithologists must have noted the song revival of this species in late August. In 1921 my notes show that it was at its height after I left the Park between Aug. 19 and 28, but these notes were made in Syracuse, N. Y.

Purple Finch. Aug. 4, 1921 and Aug. 1, 1922.

Goldfinch. This species was in song to the end of my stay in the Park in 1921 (Aug. 13), but in 1922 it was heard regularly only until Aug. 10, and once on Aug. 16.

Vesper Sparrow. July 27, 1921.

Savannah Sparrow. July 27, 1921.

Chipping Sparrow. Sang regularly until Aug. 2, 1921, and was heard again on Aug. 12 and 13.

Field Sparrow. Aug. 7, 1921, was the last date of regular singing, but one bird was heard Aug. 11. In 1922 the bird was heard on July 31, and Aug. 12 and 13.

Slate-colored Junco. July 30, 1921. In 1922 a single bird at the Buffalo Camp, probably the male owner of the nest mentioned above, sang until Aug. 7.

Song Sparrow. Still singing when I left the Park in 1921 (Aug. 13), though the song had been missed on Aug. 8, showing that the time of cessation was approaching. In 1922 the bird was heard until Aug. 19.

Towhee. Records of the two years do not agree very well on this species, for it was last heard on Aug. 3, 1921, whereas in 1922 it was heard singing regularly until Aug. 14 and once more on the 17th.

Rose-breasted Grosbeak. Last heard in 1921 on July 9. Not heard singing in 1922.

Indigo Bunting. In 1921 this species was singing until the last day of my stay, Aug. 13. In 1922 it was only heard on July 31, largely due to the fact that it was less common in the region of the Buffalo Camp.

Scarlet Tanager. Last heard July 26, 1921. Not heard singing in 1922.

Red-eyed Vireo. This species apparently has no cessation of song in either July or August, for I heard it throughout my stay in 1921, and throughout the entire month of August, 1922.

Blue-headed Vireo. This bird is perhaps not common enough in the Park to get definite notes on its song period, but it has been heard singing on every occasion that I have observed it, this in 1922 consisting of a series of dates running from Aug. 1 to 30. Perhaps it sings continuously, as does the Red-eyed Vireo. On Aug. 30 a song different from the normal one was heard, the phrases all being connected together without pauses, so that it resembled a song of the Warbling rather than the Red-eyed Vireo.

Black and White Warbler. Last heard July 30, 1921. In 1922 heard on Aug. 1 and 27, dates that evidently mark the end of summer singing and the beginning of fall revival.

Yellow Warbler. Last heard July 27, 1921. Not heard in 1922.

Black-throated Blue Warbler. Last heard July 23, 1921. In 1922 heard singing on August 5, 8, 9 and 27, but the majority of birds had evidently ceased before this.

Magnolia Warbler. This species sang until July 30, 1921. In 1922 it was heard regularly before Aug. 4, and single songs on the 7th, 11th, 16th and 24th.

Chestnut-sided Warbler. In 1921 this bird sang until July 30, though the song showed signs of diminishing July 19. In 1922 it was heard singing on Aug. 11 and 27.

Blackburnian Warbler. This bird sang until July 23, 1921, and was not heard in 1922.

Black-throated Green Warbler. This species sang until Aug. 1, 1921. In 1922 it was heard Aug. 5, 8, 9 and 22.

Ovenbird. In 1921 this bird was not heard after July 27, but in 1922 it was singing regularly up to Aug. 4, and after that date was heard on the 23d and 27th.

Mourning Warbler. This bird was not heard after July 20, 1921, but perhaps the species was not abundant enough to get a good idea of its song period. In 1922 a bird about the Buffalo Camp sang early in the morning on Aug. 4, 5, 11 and 12.

Maryland Yellow-throat. Last heard July 31, 1921, and Aug. 5, 1922. A single bird sang once or twice on Aug. 19.

Hooded Warbler. Last heard July 22, 1921, and not heard in 1922.

Canada Warbler. This bird evidently sings late. In 1921 I was not so situated that I could hear it daily, but I last heard it on Aug. 10. In 1922 it sang daily in the vicinity of the Buffalo Camp until Aug. 21, producing a great variety of song and a persistence in singing that surprised me.

Catbird. Last heard July 30, 1921; not heard in 1922.

Brown Thrasher. The Thrasher is one of the first birds to cease its song. It was not heard after July 6, 1921. I have never known it to have a revival of song in the fall, and no singing was heard at any later date in either year.

House Wren. Sang until Aug. 7, 1921, and a single bird at the Buffalo Camp was heard on July 31 and Aug. 1, 1922. It has been previously noted that the song of this species is used as a stimulus to the young wrens in the nest, to cause them to open their mouths for food (Sherman, '25, p. 100).* Many have probably noted that the male House Wren sings persistently when feeding young. In this connection there was a nest full of young House Wrens in a birch stump near the Buffalo Camp and they left the nest on Aug. 1, at the time the male ceased his song.

White-Breasted Nuthatch. Some people are evidently unaware that this bird possesses a song. One of the reasons for this is doubtless the short and irregular song period. In my experience it sings mainly in April and then only for a week or two. The song may be heard irregularly at other times. In the Allegany Park this bird is probably as common in summer as it is in most regions. The song however was heard only once in two summers,—on July 11, 1921.

Wood Thrush. Last heard July 26, 1921. Not heard in 1922.

Veery. This bird seems to have the shortest period of song among the thrushes. It was last heard July 13, 1921, and was not heard in 1922.

Hermit Thrush. This thrush evidently sings later in summer than other species. Although there were indications in August, 1921, that the song period was nearly over, yet the song was heard more or less until August 10. In 1922 birds sang continuously in the Quaker Run Valley until August 17, which led me to believe that I might have heard it later in the former year had my stay been longer.

Robin. In 1921 the Robin showed signs of ceasing song in late July, and in August was heard only on the 1st and 12th of the

* This fact was first mentioned by Miss Sherman in a paper read before the A. O. U. meeting of 1919, but not since published; and my memory of the paper has been verified recently by a letter from Miss Sherman in which she states that it is only the very young birds, whose eyes are not yet opened, that need the stimulus.

month. In 1922, however, birds about the Buffalo Camp persisted in singing pretty regularly until Aug. 11, and one was heard on the 17th.

Bluebird. The Bluebird is rather sparing in its song. It was heard in 1921 until July 23, and once on Aug. 9. In 1922, although seen frequently, it was not heard to sing.

SUGGESTIONS ON BIRD PRESERVES IN THE ALLEGANY STATE PARK

The Allegany State Park may serve a number of different purposes: a place for recreation for summer campers, a public hunting and fishing ground under suitable restrictions, an area on which forestry may be practised and studied, and where its results may be educational to the public, a game preserve, and a place where scientific study of all forms of wild life may be carried on (cf. Adams, '21). All of these cannot of course be accomplished on the same area, but the Park is large, and different areas can be set aside for the different purposes.

For the study of wild life it is important that the areas set aside be as nearly natural, undisturbed areas as possible. It is difficult to find such entirely natural areas in the United States today, and as time goes on it will be increasingly so. The wild life found on cut-over or burned-over areas, areas of second growth, etc., is of a temporary character, and does not represent the conditions as they once were. Some species are gone. Others that would not be there under original conditions have come in, while in others the proportionate abundance has changed, or the habits of living have changed to suit the changed conditions. It is important then that in the Allegany Park we set aside areas as nearly in their primeval character as possible, and that these areas remain undisturbed, all forms of life in them being permitted to live and breed.

Since the Allegany Park is forested land, this means that the areas should be primeval forest. It is impossible to find in the Park areas today any portion that has not been more or less cut over for timber, but there are some portions where large numbers of the original trees remain, and conditions are as nearly primeval as it is possible to find them. There are two types of forest land in the Allegany Park, as I have previously stated (Saunders, '23, p. 282). These are the maple-beech forest and the oak-chestnut forest. While the species from which these types take their name are the most abundant species on the particular areas, these are by no means

the only trees. With the differences in the tree species found on these areas go certain differences in the animal and bird life. (Cf. also Silloway, '23, pp. 401-431.) It is desirable then, to set aside primeval areas that represent both types of forest. This cannot be done in a single area, for no area was found where primeval conditions representing both types of forest were near each other. It is therefore necessary to have two such areas.

The best tract of maple-beech forest in the Park is that known as the Big Basin, in the drainage of Red House Creek. Here a fairly large area has been only slightly culled over for lumber in the past. Some of the largest hemlocks and some of the cherry and ash were removed long ago, but there still remains a magnificent forest of large sugar maple, beech, ash, basswood, birch, hemlock and others; while in many places there is a dense undergrowth of younger individuals of these species and of forest shrubs, with numerous old fallen logs, usually partly decayed and covered with moss and ferns. Already forests of this sort are decidedly scarce. The day may come when they will be almost totally lacking. If we can save the Big Basin as it is, it will become a place of tremendous interest and value to foresters, naturalists, and all nature lovers.

In several trips to the Big Basin (July 19 and August 1, 1921, and August 17, 21, and 22, 1922) the following bird species were noted: Ruffed Grouse, Sharp-shinned Hawk, Barred Owl, Hairy Woodpecker, Downy Woodpecker, Sapsucker, Flicker, Wood Pewee, Crow, Slate-colored Junco, Scarlet Tanager, Red-eyed Vireo, Blue-headed Vireo, Black and White Warbler, Black-throated Blue Warbler, Magnolia Warbler, Chestnut-sided Warbler, Black-throated Green Warbler, Blackburnian Warbler, Ovenbird, Hooded Warbler, Brown Creeper, Winter Wren, White-breasted Nuthatch, Chickadee, Wood Thrush, Hermit Thrush, Olive-backed Thrush and Robin. The Ruffed Grouse is not as common here as in the second growth areas of the Park, and for some curious reason the Wood Thrush is commoner than the Hermit, though the reverse is true for the greater part of the Park area.

In addition to the bird life and the magnificent forest of the Big Basin, there is other animal life of interest that would benefit by the saving of the area. Gray squirrels of the black color phase are perhaps the commonest, or at least the most likely to be seen; but good evidence, largely foot tracks along the shores of the small streams in the heart of the Basin, show that raccoons, foxes and wildcats occur there, and there is other evidence of porcupines and



Fig. 151. An old moss-covered log and ferns; a feature of the Allegheny Park forest. Photo taken on the trail from Buffalo Camp to the caves. August 26, 1922.



Fig. 152. Typical young maple and beech forest, Allegheny State Park. View along trail between Buffalo Camp and the caves. August 26, 1922.

skunks. In the lower part of the Basin, in Stoddard Creek and its branches, trout are reasonably common. With the area properly protected, deer, mink and bear should occur, so that the place would be fairly rich in interesting animal life.

I am not aware that any plants of extreme rarity grow in the Big Basin, but it has a rich flora in woodland plants of many sorts. The humus is deep, the ground is covered with moss and ferns and old moss-grown logs, and partridge vine, wintergreen, goldthread, wood sorrel, trilliums, hepaticas, violets, and a wealth of similar plants, should make the place well worth the consideration of botanists and flower lovers.

The areas of oak-chestnut forest in the Park are all toward the west and not far from the Allegany River. No such large, almost uncut areas of this type similar to the Big Basin occur in the Park. There are some smaller areas however. One of these, that will probably be the best one to save, lies on the north side of Quaker Run, next to the west boundary of the Park, the line of the Indian Reservation. Here is a long wooded ridge where there is still a good stand in places of the original forest. Part of this area has been cut off and is second growth, but the forest that still remains is largely chestnut, white oak, red oak and hickory, with a few scattered hemlocks and white pines. In one spot a small grove of mature white pine occurs. The chestnut disease has only started in this area (in 1922), and most of the trees are still green and vigorous, but it would be too optimistic to hope that they will not go the way of the other chestnuts throughout the country. In that respect the forest here, for a long time, and perhaps never, will be the same as it was originally.

The birds that I have noted in this area are the Woodcock, Ruffed Grouse, Red-tailed Hawk, Hairy Woodpecker, Downy Woodpecker, Flicker, Whip-poor-will, Wood Pewee, Blue Jay, Crow, Chipping Sparrow, Field Sparrow, Towhee, Indigo Bunting, Scarlet Tanager, Red-eyed Vireo, Black and White Warbler, Black-throated Blue Warbler, Chestnut-sided Warbler, Ovenbird, Mourning Warbler, Maryland Yellow-throat, Whitebreasted Nuthatch, Chickadee, Wood Thrush, Veery and Robin. These birds do not all belong properly to this type of forest, but their presence in the area is due to second growth. This is particularly true of the Field Sparrow, Towhee and Indigo Bunting. The Veery and Yellow-throat owe their presence to a small springy wet slope on one side of the area where willows, alders and other moisture-loving trees and plants appear. The occurrence of the Woodcock on this high, dry ridge seemed rather a surprise, and it is perhaps not to be regularly expected.

No information was obtained concerning the animal life other than birds on this area. The plant life is distinctly different from that of the Big Basin, the woody undergrowth being largely of sassafras, New Jersey tea, bush honeysuckle, and silky dogwood, and the herbaceous plants dominated by eagle fern (*Pteris aquilina*), dogbane and fireweed. Among the plants occurring on this area are two beautiful species, the pink lady slipper and the trailing arbutus, that are among the list that we have reason to fear may become exterminated near civilization.

These two areas are perhaps best set aside with the roads already existing to act largely as boundaries. This would include in both cases some areas not of the character desired to save; but with the elimination of those areas already in farm land, the roads will form a well marked boundary inside of which it will soon be understood that all hunting or cutting of trees or other destruction of nature is forbidden. Thus the Big Basin area would be included between the road up Red House Creek on the north and east, and the road up Baystate Creek and the Indian Reservation boundary on the south and west, these roads joining each other at the southeast corner of the area. The other area would be bounded on the west by the Indian Reservation line, on the north by the road up Pine Creek, which continues around the east side, and down Holt Run, to the north boundary of the Quaker Farm, which would form the south line back to the Indian Reservation.

The saving of these two areas would not only accomplish one of the purposes of the State Park, but would act as a game preserve, a place where hunting would not be allowed, and the Ruffed Grouse and possible other game would have an opportunity to increase undisturbed. This would undoubtedly improve the hunting in surrounding regions. It would however upset the main purpose of the area if the destruction of natural enemies of game was allowed. Those who insist that destruction of natural enemies is necessary to the welfare of game, however, would soon find in the areas an example to show whether their theories would produce a greater abundance of healthy game than such an area as this, where all wild creatures would be allowed to live their lives undisturbed.

SUMMARY AND CONCLUSIONS

1. Competent authority is necessary in handling wild life problems in the Allegany State Park. It is dangerous and detrimental to the purpose of the Park to destroy species that are popularly

supposed to be vermin. An indefensible attempt to destroy all hawks in the Park has resulted in a decrease of the valuable Red-tailed Hawk, and an increase of the harmful Sharp-shinned Hawk. This may result in too great an increase of certain harmful rodents; a decrease of smaller songbirds, and following that, an increase of insects harmful to the vegetation.

2. To accomplish one of the purposes for which the Allegany Park was created it is desirable to set aside two specific areas, representing the two types of forest in the Park. These areas should be kept under natural conditions for future scientific study. All forms of plant and animal life should be preserved on these areas, whether popularly supposed to be "vermin" or not.

LIST OF REFERENCES

ADAMS, CHAS. C.

1921. Suggestions for the Management of Forest Wild Life in the Allegany State Park, New York. *Roosevelt Wild Life Bull.*, Vol. 1, No. 1, pp. 62-74.

BICKNELL, EUGENE P.

- 1884-85. A Study of the Singing of our Birds. *The Auk*, Vol. 1, pp. 60-71, 126-140, 209-218, 322-332; Vol. 2, pp. 144-154, 249-262.

BOWLES, J. H.

1906. The Kennicott Screech Owl. *The Condor*, Vol. 8, pp. 143-144.

FISHER, A. K.

1893. The Hawks and Owls of the United States in their Relation to Agriculture. U. S. Dept. Agri., Div. of Ornithology and Mammalogy, Bull. 3, pp. 1-210.

FRY, HENRY J.

1916. A Study of the Seasonal Decline of Bird Song. *The Auk*, Vol. 33, pp. 28-40.

HOWARD, H. ELIOT

1920. Territory in Bird Life. Pp. 1-308. New York.

SAUNDERS, ARETAS A.

1911. A Study of the Nesting of the Cedar Waxwing. *The Auk*, Vol. 28, pp. 323-329.
1923. The Summer Birds of the Allegany State Park. *Roosevelt Wild Life Bull.*, Vol. 1, No. 3, pp. 239-354.

SAWYER, EDMUND J.

1923. The Ruffed Grouse, with Special Reference to Its Drumming. Roosevelt Wild Life Bull., Vol. 1, No. 3, pp. 355-384.

SHERMAN, ALTHEA R.

1925. The Problem of the House Wren. Bird-Lore, Vol. 27, No. 2, pp. 97-100.

SILLOWAY, PERLEY M.

1923. Relation of Summer Birds to the Western Adirondack Forest. Roosevelt Wild Life Bull., Vol. 1, No. 4, pp. 393-486.

CONVERSATION AND DEMOCRACY

The movement for the conservation of our natural resources, for the protection of our forests and of the wild life of the woods, the mountains and the coasts, is essentially a democratic movement. Democracy, in its essence, means that a few people shall not be allowed for their own selfish gratification, to destroy what ought to belong to the people as a whole. The men who destroy our forests for their own immediate pecuniary benefit, the men who make a lifeless desert of what were once coasts teeming with a wonderfully varied bird life, these, whether rich or poor, and their fellows in destruction of every type, are robbing the whole people, are robbing the citizens of the future of their natural rights.

THEODORE ROOSEVELT,

Supplement to *Animal Sanctuaries in Labrador*,
p. 29; 1912.

CURRENT STATION NOTES

WILD LIFE PRESERVES AND WASTE LAND

There is a widespread movement throughout the Nation striving to arouse public interest and support for setting aside "waste land" areas for the conservation of various kinds of wild life. Submerged lands in particular have suffered severely from the encroachments of agriculture and, to a remarkable degree, from land speculators whose only concern is for quick returns on their investment.

To assist in retarding the destruction of the remaining resources in these so-called waste lands and to aid in their appreciation by the public, one should first acquaint one's self with the actual conditions of these lands and of their wild life. Thus basal surveys are urgently needed. Only too often a few days devoted to superficial field excursions is all that is done or thought necessary before entering upon a comprehensive program for the conservation of the wild life of an area, only to discover, when confusion arises, that practice advanced too rapidly and outran the solid basis of fact.

Certain waste lands should be looked upon not merely as preserves for wild life — actual sanctuaries for the preservation of wild life — the overflow from which might be commercialized, but in addition the value of such lands for park purposes should become more fully appreciated. It seems rather strange that the recognition of this has progressed so slowly. With the extensive plans now developed for the parks of New York State, provision should be made for the inclusion and preservation of these wild lands for recreational, educational and scientific study.

Furthermore the State "Conservation Fund," derived from the license fees from hunting, angling and trapping, might very well be used in part, for the purchase of these wet "waste lands" of the Montezuma Marsh region and elsewhere for game and other kinds of wild life. We need preserves not only for game but as well for mammals, birds, fish, and for at least some of the fur-bearing animals.

We must have careful surveys in order to know what areas to set aside. With this in view the Roosevelt Wild Life Station made in 1923 a survey of the areas suitable for muskrats in Central New York, particularly in the remaining wet lands of the Montezuma Marsh region where extensive muskrat farming is now practiced. The study was made by Dr. Charles E. Johnson and was published as *Wild Life Bulletin*, Vol. 3, No. 2. At the same time a study of the birds, particularly of the Montezuma Marsh and adjacent swamp

lands, was made by Mr. Aretas A. Saunders. His report, published in this number of the *Bulletin*, was planned as a definite contribution to one phase of the general problem, and illustrates how other areas should be similarly and more intensively studied.

RECOGNITION OF MERIT

Since the publication of the preceding number of the *Bulletin* two members of the Honorary Advisory Council of the Roosevelt Station have received recognition for their lifelong work for conservation in fields in which Theodore Roosevelt was particularly active. In fact these men were co-workers with Roosevelt in a large part of this work. This recognition came from the Roosevelt Memorial Association, New York City, in the form of medals presented to Doctor George Bird Grinnell who, for a generation, has been a leading champion of wild life conservation and of the establishment and preservation of our National Parks, and also to Governor Gifford Pinchot who has been our leading champion of conservation of natural resources in general, and in particular those of forests, in cooperation with Roosevelt helping to build up the National Forests and the Federal Forest Service until it has become one of the most efficient governmental agencies. The Roosevelt Memorial Association has honored itself in recognizing the work of these men, and the Roosevelt Wild Life Station heartily congratulates both the members of our Council and the Memorial Association for this merited honor.

THE ROOSEVELT WILD LIFE MEMORIAL

As a State Memorial

The State of New York is the trustee of this wild life Memorial to Theodore Roosevelt. The New York State College of Forestry at Syracuse is a State institution supported solely by State funds, and the Roosevelt Wild Life Forest Experiment Station is a part of this institution. The Trustees are State officials. A legislative mandate instructed them as follows:

"To establish and conduct an experimental station to be known as 'Roosevelt Wild Life Forest Experiment Station,' in which there shall be maintained records of the results of the experiments and investigations made and research work accomplished; also a library of works, publications, papers and data having to do with wild life, together with means for practical illustration and demonstration, which library shall, at all reasonable hours, be open to the public." [Laws of New York, chapter 536. Became a law May 10, 1919.]

As a General Memorial

While this Memorial Station was founded by New York State, its functions are not limited solely to the State. The Trustees are further authorized to cooperate with other agencies, so that the work is by no means limited to the boundaries of the State or by State funds. Provision for this has been made by the law as follows:

"To enter into any contract necessary or appropriate for carrying out any of the purposes or objects of the College, including such as shall involve cooperation with any person, corporation or association or any department of the government of the State of New York or of the United States in laboratory, experimental, investigative or research work, and the acceptance from such person, corporation, association, or department of the State or Federal government of gifts or contributions of money, expert service, labor, materials, apparatus, appliances or other property in connection therewith." [Laws of New York, chapter 42. Became a law March 7, 1918.]

By these laws the Empire State has made provision to conduct forest wild life research upon a comprehensive basis, and on a plan as broad as that approved by Theodore Roosevelt himself.

Form of Bequest to the Roosevelt Wild Life Memorial

I hereby give and bequeath to the Roosevelt Wild Life Forest Experiment Station of The New York State College of Forestry at Syracuse, for wild life research, library, and for publication, the sum of, or the following books, lands, etc.

ROOSEVELT WILD LIFE BULLETIN, Vol. 2, No. 1. October, 1923.

1. The Control of Blood-sucking Leeches, with an Account of the Leeches of Palisades Interstate Park.....Dr. J. Percy Moore.
2. Preliminary Report on the Parasitic Worms of Oneida Lake, New YorkDr. Henry S. Pratt.
3. Acanthocephala from the Fishes of Oneida Lake, New York.....Dr. Harley J. Van Cleave.
4. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. 2, No. 2. February, 1924.

1. The Ecology of the Plankton Algae in the Palisades Interstate Park, Including the Relation of Control Methods to Fish Culture.....Dr. Gilbert M. Smith.

ROOSEVELT WILD LIFE BULLETIN, Vol. 2, No. 3. March, 1924.

1. The Status of Fish Culture in Our Inland Public Waters, and the Role of Investigation in the Maintenance of Fish Resources.....Dr. William C. Kendall.
2. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. 2, No. 4. February, 1925.

1. The Relation of Wild Life to the Public in National and State Parks. Dr. Charles C. Adams.
2. The Big Game Animals of Yellowstone National Park.....Edmund Heller.
3. The Food of Trout in Yellowstone National Park.....Dr. Richard A. Muttkowski.
4. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. 3, No. 1. February, 1925.

1. The Birds of the Yellowstone National Park....Milton P. Skinner.
2. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. 3, No. 2. March, 1925.

1. The Muskrat in New York: Its Natural History and Economics.....Dr. Charles E. Johnson.
2. Current Station Notes.....The Director and Editor.

ROOSEVELT WILD LIFE BULLETIN, Vol. 3, No. 3. SEPTEMBER, 1926.

1. The Summer birds of Central New York Marshes. Aretas A. Saunders.
2. Additional Notes on the Summer Birds of Allegany State Park.....Aretas A. Saunders.
3. Current Station Notes.....The Director and Editor.

